Marine Review

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« EDITORIAL »

Lower Operating Costs for Modern Vessels

IN LISTENING to the presentation of papers and their discussion during the recent annual meeting of the Society of Naval Architects and Marine Engineers one could not help but be greatly impressed with the work being done by American engineers in advancing the art of shipbuilding and marine engineering.

It is strikingly apparent that progress has been so rapid in the last few years that a shipowner cannot fail to see that all his old vessels must operate under a serious handicap in competition with these new vessels for which the shipbuilder is only too glad to guarantee all around efficiencies unheard of less than four years ago.

This modernization has been accomplished in more than one way as the lively interchange between proponents of steam and diesel at the meeting brought out so vividly.

So remarkable have been the advances made in marine steam engineering that the anticipated performance of a modern steam installation of 6000 horsepower giving a fuel consumption of .518 pound of fuel per shaft horsepower per hour for all purposes was generally accepted as entirely dependable and conservative.

Those leaning to the superiority of the diesel engine for propulsive power because of its still greater thermal efficiency feel that the advances made in steam engineering have been directly due to the tremendous pressure brought to bear by the performance of the diesel. They further claim that though the spread in fuel consumption between steam and diesel has been so greatly reduced there are latent, and in several recent installations, to some extent, developed possibilities of further economies in use of diesel power. Particular stress was laid on comparatively new developments in utilizing much of the waste heat.

The startling suggestion was made that for a two-cycle, single acting, mechanical injection diesel consuming .40 pound per brake horsepower per hour of fuel with a heat value of 19,000 B.t.u. per pound an expected heat balance and possible waste heat recovery would work out to give a thermal efficiency of 62.6 per cent if all the heat in the cooling water is recovered and none from the exhaust; also, that a thermal efficiency of 79 per cent would be possible if all the heat in the cooling water and one-half of the heat in the exhaust were recovered. This, the diesel proponent puts up against the performance of the proposed steam installation referred to above of .518 pound of fuel per horsepower per hour, calling attention to the fact that this very low fuel consumption for steam would be equivalent to a thermal efficiency of 25.85 per cent. To this those who favor steam say, that if any such extraordinary heat recovery were possible under practical operating conditions on board ship, what use is to be made of this heat?

For modern steam machinery the claim is made that it will provide propulsion equipment that is highly economical and thoroughly reliable and that the predominance of this type of machinery in this country is due to sound engineering and a careful analysis of all facts. It is further claimed that machinery weights and costs are less for steam than for diesel. On the other hand, diesel proponents claim that modern developments in building marine diesel engines have altered the situation in regard to both of these items. Those who favor the diesel claim for it not only lower fuel consumption and higher thermal efficiency, but also the added advantage of ability to make long voyages without refueling.

These conflicting claims need not confuse the progressive steamship owner. Through his unbiased engineering advisers, he will settle the question of power to the best advantage for his particular need. He will expect and demand reasonable guarantees both in efficiency and reliability. He will be very much interested in all of the facts of performance of actual ships, both steam and diesel. The objective in the final analysis, as stated in one of the papers presented, is to install that type of machinery that will have the lowest net cost and will bring the greatest return on the investment. It will be incumbent for those who are to supply such machinery, be it steam or diesel, to demonstrate the accuracy of their claims.

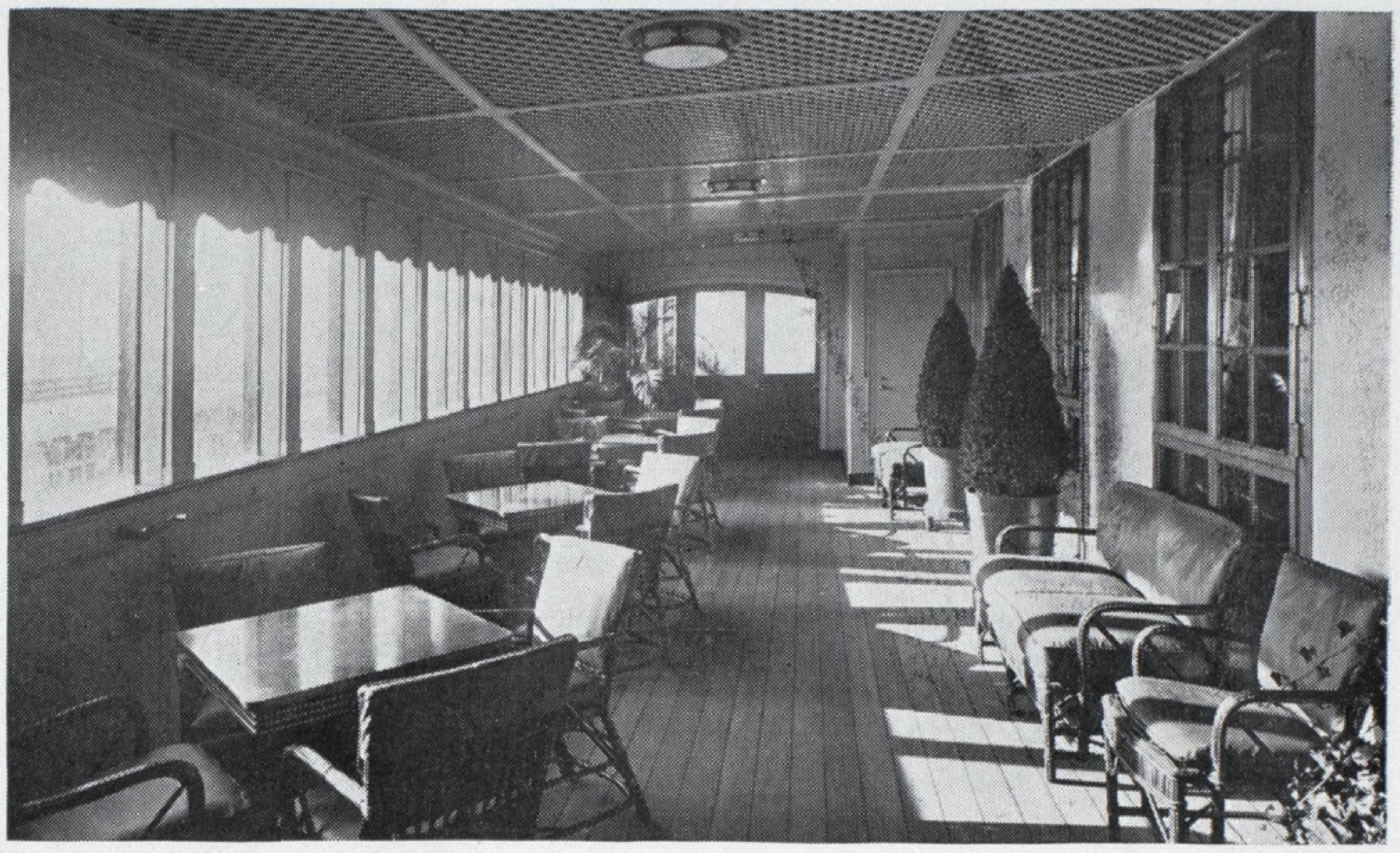
SANTA ROSA

First of Four Grace Liners Completed

THE newest of American-built ships, the Grace liner SANTA ROSA, leaves New York for her maiden voyage Nov. 26 to Havana, Panama, Costa Rica, El Salvador, Guatemala, Mexico, California, Victoria, B. C., and Seattle. The SANTA ROSA was built and her three sister ships are now being built by the Federal Shipbuilding & Dry Dock Co., Kearny, N. J., from designs by Gibbs & Cox, naval architects, New York.

The Grace line's four latest contributions to the American merchant marine are the first American ships having all outside rooms with private baths. Their most striking characteristics are the luxuriously home-like atmosphere of every room and the genuine American spirit that prevails throughout.

The four new Grace liners have been designed and decorated with the idea that the greater part of each voyage will be made over tropical waters. Public rooms have been brought "up top" where there is ample light and air; decks made broad and with as few obstructions as possible; colors and materials used that are cool and "summery."



Palm Court S. S. Santa Rosa

General Arrangement of Structure

The SANTA ROSA may be described as flush deck ship with complete superstructure and having a combined bridge and forecastle extending over four-fifths of the vessel's length from the stem. There are eight steel decks including the house top.

A cellular double bottom with floors on every frame is fitted from the forepeak bulkhead to the after peak bulkhead and extends outboard with the margin forming a "convention" protection in way of the bilges.

There are three cargo holds forward of the boiler room, a group of fuel oil storage tanks between the boiler room and engine room, and three cargo holds aft of the engine room together with fuel oil tanks outboard of the shaft alleys and fresh water tanks between the shaft alleys aft of the forward cargo space.

There are nine double bottom tanks in addition to the fore and aft peak tanks and all these may be used for the storage of fresh water or ballast, with the exception of the double bottoms under the fuel oil tanks between the engine and boiler rooms which are arranged as fuel oil storage tanks and are separated forward and aft from the adjacent tanks by cofferdams.

In laying out the water-tight subdivision of the SANTA ROSA and sister ships, the requirements of the international convention for safety of life at sea, London, 1929, were more than met in every particular. There are ten transverse watertight bulkheads, all extending to the B deck which is the bulkhead deck, with the exception of the forepeak bulkhead which extends one deck higher. These bulkheads subdivide the ship into 11 watertight compartments and the ship is so arranged that it will remain afloat even with any two adjacent compartments completely flooded.

Where it has been necessary to pierce these watertight bulkheads, power operated doors are provided which may be worked either locally or from the bridge, with a tell-tale indicator to show the position of all doors.

The SANTA ROSA was launched on March 24 and the three sisterships were launched as folows: SANTA PAULA on June 11, SANTA LUCIA on Oct. 3, and SANTA ELENA to be launched Nov. 30. Thus this $20,000,000 shipbuilding program is now approaching completion. The last of the four sisterships, the SANTA ELENA, is scheduled to enter service in April next year.

Accommodations

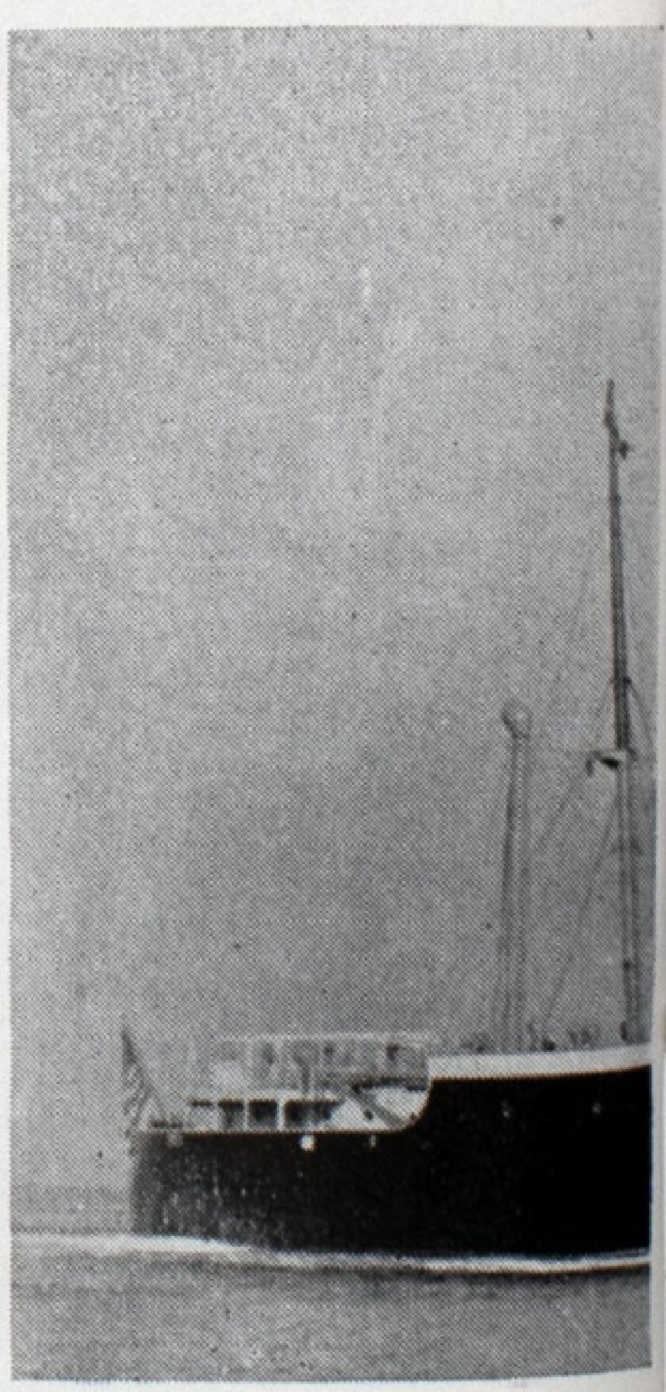
The SANTA ROSA and sister ships will operate from New York through the Panama canal to the West coast of the United States and consequently will be in the tropics for a considerable part of each voyage.

In designing the accommodations, this fact was borne in mind and every effort made to provide living spaces that would be light and airy at all times.

The accommodations for the deck officers are located at the forward end of the boat deck, aft of the wheel house. The captain's quarters include the chart room, day cabin, bedroom and bath and on the port side are separate rooms for first, second, third and fourth officers, chief electrician, two junior electricians and two purser's clerks. On the starboard side are the captain's rooms, radio room, stateroom for two radio operators and rooms for six junior engineers.

The after end of this space is occupied by the movie booth from which

Santa Rosa — Twin Screw, Geared Turbine — Combination Passenger and Cargo Liner Sailed on Maiden Voyage from New York Nov. 26



pictures are projected into the dining saloon.

The space between the two stacks is taken up by the dining room which extends from the promenade deck up to a domed structure extending somewhat above the top of the boat deck house, thus providing a very considerable height for this room. The roof of this structure is provided with two sliding parts so that in good weather, the roof may be opened and in combination with the large casement windows on the sides, practically throws the dining saloon into an open air space.

Abaft the after stack are located the various pantries and galley and also accommodations for the chief engineer, four assistant engineers and the deck officers and engineer officers' messroom. This arrangement of the galley and pantries is somewhat unusual for this type of vessel and offers advantages over the usual arrangement where the galley is located below decks, in that the cooks, bakers and assistants will all have excellent light and ventilation and all odors from the cooking will be immediately discharged into the atmosphere and cannot pass around through the various passenger accommodations.

The galley facilities include storerooms, sculleries, electric ranges, electric bake ovens, potato peelers, waffle irons and other modern electric equipment for this kind of service.

The lifeboat equipment is located on this deck and includes seven lifeboats with a capacity of 60 persons each and one motor lifeboat with a capacity of 54 persons. The Welin quadrant type of davit serves all lifeboats.

On the promenade deck are located the living room which is forward, the dining rooms, library, grille and the club. These spaces are set well back from the ship's rails so as to provide a promenade around the sides and forward and after ends. The forward end of the deck surrounding the living room is entirely enclosed and fitted with large frameless sliding windows and forms the palm court. In this space are card tables, chairs and other seats.

The living room is fitted with various chairs, lounges, writing desks, a grand piano and suitable lamps on tables and in brackets on the walls. There is also on the after bulkhead a large open fireplace. The room has been done in the Georgian style throughout with all of the decorations and furnishings in keeping with this period. Large swinging doors are provided on the sides and French windows on the forward walls which reach to the deck so that with all these doors open, the room is practically a part of the palm court and in the tropics will then be completely open to the breezes from outside.

On either side and aft of the fireplace is an easy stairway leading down to the deck below, on which are located the purser's office and passenger living accommodations.

Passing aft on the starboard side, one enters the library which is a comfortable, homelike room with walls panelled in natural pine. This room is fitted with writing tables, comfortable chairs and book cases on the walls. There is also an open fireplace against the inboard wall.

On the opposite side of the ship in the corresponding space is a small dining room, accommodating about 27 persons which may be used as an auxiliary for the main dining room or for private dinners when so desired.

Both the library and the small dining room open directly into the main dining room, and there is also access from the deck on both sides. This dining room is two decks high for its full width and over the center section is practically three decks high because of the raised dome construction. At the forward end is located the musician's balcony on the boat deck level. On the wall at the after end of the dining room hangs a large painting by Charles R. Patterson of a full rigged ship, the M. P. GRACE, one of the early ships of the Grace line. This ship was built in Bath, Me., in 1875 and named after the brother and partner of the founder of the company, W. R. Grace. Under the command of Captain R. F. Wilbur, this fine old ship made many trips from New York to San Francisco and return via Cape Horn. The dining room is fitted with large casement windows.

A large screen is provided which can be quickly set up and covering the space occupied by the painting and on this screen will be shown moving pictures projected from the movie booth at the forward end of the dining room.

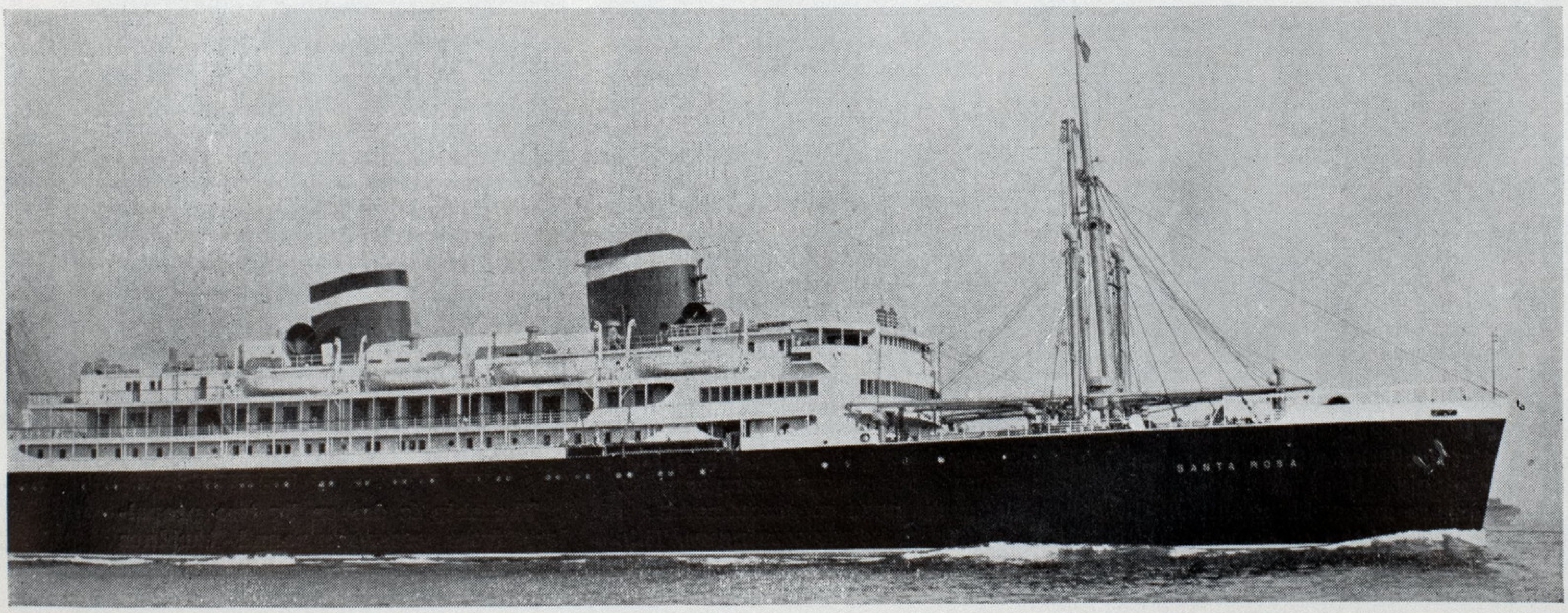
Aft of the main dining room on the starboard side is the grille which will accommodate about 30 persons.

The corresponding space on the port side of the deck is taken up by a stateroom and washroom and the stairways from the galley and pantries. The grille is separated from the club, which occupies the after end of the deck house structure, by a foyer, from which a stairway leads down amid-

Principal Characteristics

Length overall, feet	508
Length between p.p., feet	484
Beam molded, feet	72
Depth to "B" deck, feet, inches	38 11½
Load draft, feet, inches	26 2½
Gross Tonnage	11,200
Displacement, approximate, tons	16,500
Normal horsepower (about)	12,500
Number of Propeller Shafts	2
Contract speed, loaded, knots	18.5
Passengers, First Class	225
Passengers, Third Class	65

The vessel has been built in accordance with the rules of the American Bureau of Shipping to entitle it to highest class + A 1 E and under survey of the society. The vessel also complies with all the rules and regulations of the United States steamboat inspection service and the full requirements of the international convention for safety of life at sea, London 1929, except that the bulkhead subdivision is superior to that required by the convention. Also, the vessel meets the public health service requirements for fresh water and ratproofing.



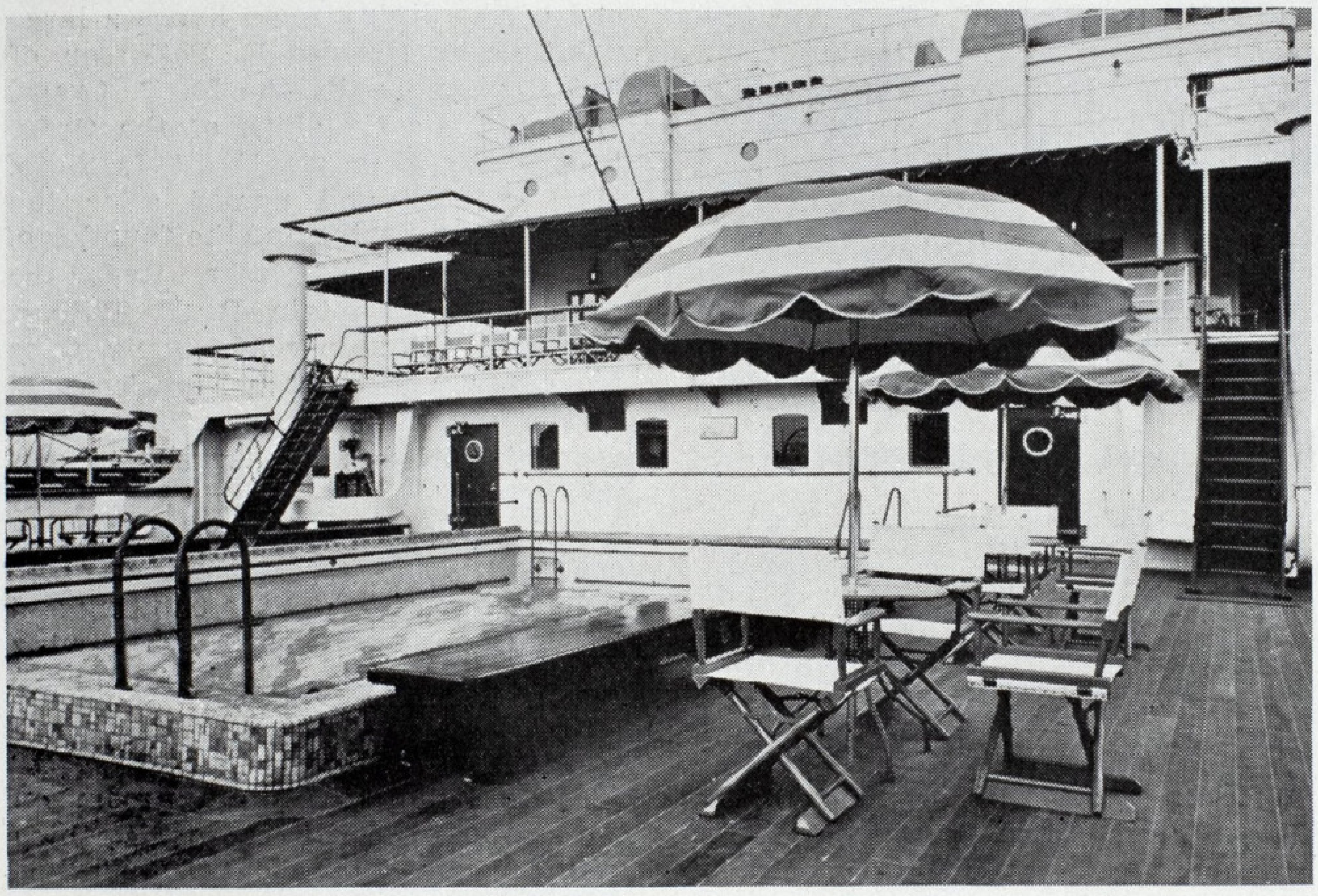
ships to the A deck below. This club space will serve as a combination smoking, dancing and entertainment room, the center portion of it being fitted with a hardwood dance floor. On the port side in the space corresponding to the foyer is the bar. The after wall of the club is formed by large sliding doors which when opened up adds this space to the deck outside. The deck will be covered by an awning so that all of this space becomes an open air verandah overlooking the swimming pool and sports deck below.

The promenade deck is of sufficient width to accommodate the usual steamer chairs against the deckhouse structure and still provide ample walking space for passengers desiring exercise.

ship group of rooms on both sides of the ship, numbers 16 to 27, inclusive, are larger and are arranged with a living room and bedroom on each side and by means of communicating doors can be used as one room, two room or three room suites as may be desired.

The remainder of this deck at the after end is a sports deck with a large tiled open air swimming pool in the center, 20 x 35 feet. This pool is arranged in two depths. one 5 feet and one 7 feet. It is also fitted with submerged lights for night use. This sports deck with its swimming pool and the veranda club on the deck just above will form one of the most interesting outdoor features of life on the ship.

The B deck located just below the



Outdoor Swimming Pool — S. S. Santa Rosa

The bridge, or A deck, is given up almost entirely to passenger accommodations. The purser's office is conveniently located forward, amidships, facing the stairway coming down from the promenade deck.

The midship section in this deck is taken by uptake spaces, lavatories, trunk room, photographic dark room and aft a novelty shop and gymnasium, and outboard on the port side, a barber shop and beauty salon.

On each side of this section is a wide passageway extending the full length of the deck, these passageways giving access to the passenger accommodations.

Passenger accommodations consist of 41 outside rooms, every room being fitted with its bathroom containing either a shower or tub, or a combination of shower and tub with lavatory and toilet facilities. Of these rooms, 14 are single, the remainder are double or are arranged in suites. In addition some of the single rooms can be made into double rooms by means of communicating doors. The mid-

A deck also is given over almost entirely to passenger accommodations.

Access to this deck is had by staircases forward and aft. A section on the centerline of the ship is utilized by the uptake spaces, lavatories, deck pantry and five inside rooms. All of the other rooms are located outside of the fore and aft passageways and are outside rooms with wardrobes and bathrooms. Some of these rooms are arranged with doors to form double rooms if desired and most of them are fitted with a pullman bath that folds up into the ceiling and is completely out of sight when not in use.

On the after portion of the B deck abaft the cargo hatch is a deckhouse containing six rooms for third class passengers. These rooms are arranged to accommodate either four or six passengers each.

Directly below this space and also extending aft is an open compartment which is arranged to accommodate a total of 36 third class passengers. This compartment, however, will be for men only.

Two large toilet spaces are provided on this deck for the use of the third class passengers.

The dining room for these passengers is located on the B deck and is entirely separate from the quarters and is reached by the open deck and the working alleyway on the starboard side of the ship.

The midship section of the ship on the C deck from the forward side of the boiler room hatch to somewhat aft of the engine room hatch is given over to crew's quarters and provides living spaces for the various members of the ship's personnel in different groups, such as oilers, firemen, pantrymen, coast crew, messmen, etc., and the various crew's messes are in separate rooms grouped in the immediate vicinity of the crew's galley on the starboard side. In this space is also located the quarters for the waitresses who are in a compartment entirely isolated from the remainder of the ship.

Galley Electrically Equipped

As previously noted the first class galley and pantries are located on the after part of the boat deck and are very completely equipped with all modern labor and time-saving devices that are applicable for shipboard use, and in addition, the location of the different parts has been so worked out as to produce a steady flow of materials through the galley.

In addition to sinks, serving counters, pan racks and dressers, there are in the galley three electric hotel ranges, one electric broiler with warming compartment, one large steam jacketed stock pot, one, three-compartment vegetable steamer, one, two-compartment refrigerator and a motor-driven mixer, and a motor-driven milk emulsor.

The galley has been arranged so that all equipment, except actual supports are clear of the deck so that cleaning is facilitated, and large drains ar provided in the deck for carrying away washing water.

The bakery is equipped with dough troughs, shelves, pan racks, refrigerator, motor-driven mixer, proofer and electric oven sink and other smaller fittings.

There are various other sections of the commissary department, such as the butcher shop which is well equipped with labor-saving devices such as electric slicing machine and meat chopper. The deck pantries on the B deck and promenade deck are fitted up with steam heated coffee urns, electric toasters, griddles, egg boilers and refrigerators.

Main Propulsion Machinery

The ship is driven by two propellers from cross-compound turbines through reduction gears, each main unit normally developing 6000 shaft

horsepower with an overload capacity of 10 per cent.

The turbines are designed for a normal steam pressure of 375 pounds per square inch and a total temperature of 725 degrees Fahr. at the main valve, and a vacuum of 28¼ inches. Under these conditions, and with the ship at load draft, the propeller revolutions will be about 95 per minute, the high pressure turbine 4500 revolutions per minute and the low pressure turbine 3530 revolutions per minute.

The reversing turbines are designed for 85 per cent normal torque, at 50 per cent speed and normal ahead steam flow.

The turbine units are very simple, but of unusually substantial design and construction and of high efficiency.

In order to operate successfully with the high temperatures imposed and with the temperature changes required under various operating conditions, almost all of the turbine parts, with the exception of the low pressure diaphragms are of steel.

The rotors of the turbines are what is known as the "solid rotor" type, each machined from a single forging with the buckets set in.

The high-pressure rotor has for forward rotation one 2-row wheel and ten single-row wheels, while the low pressure rotor has for forward rotation, eight single-row wheels. On this same rotor are the reversing wheels, consisting of one 2-row wheel and one single row wheel.

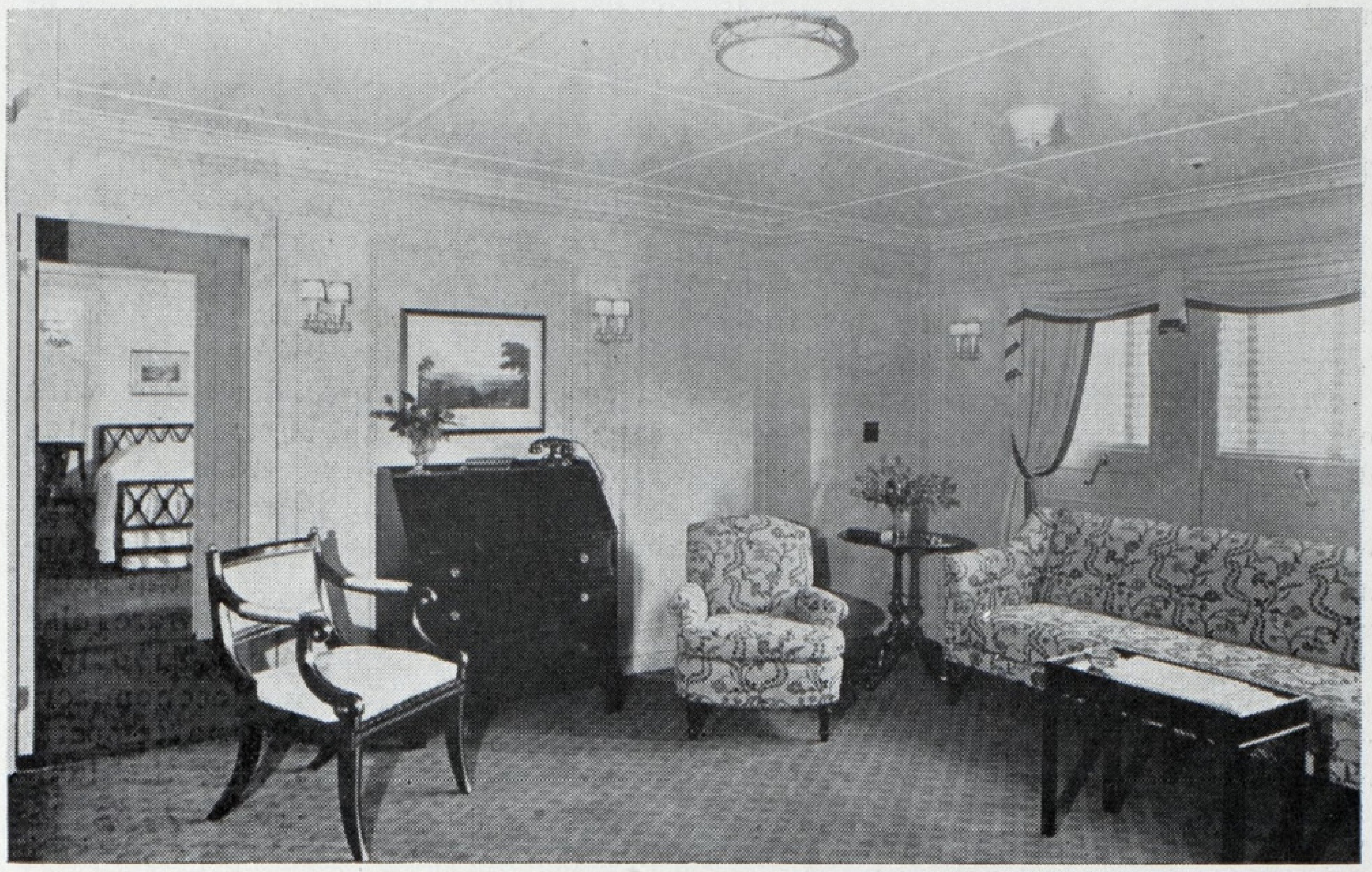
The turbine buckets are all of chrome-iron alloy, machined from bar stock, a material that is effective in resisting corrosion and erosion.

All lubricating oil for the turbine bearings is pumped to an overhead tank from which it flows by gravity to the various units. In this line is located an automatic control valve on the main governor valve, which will cut steam off the turbines if the oil pressure falls below a safe limit.

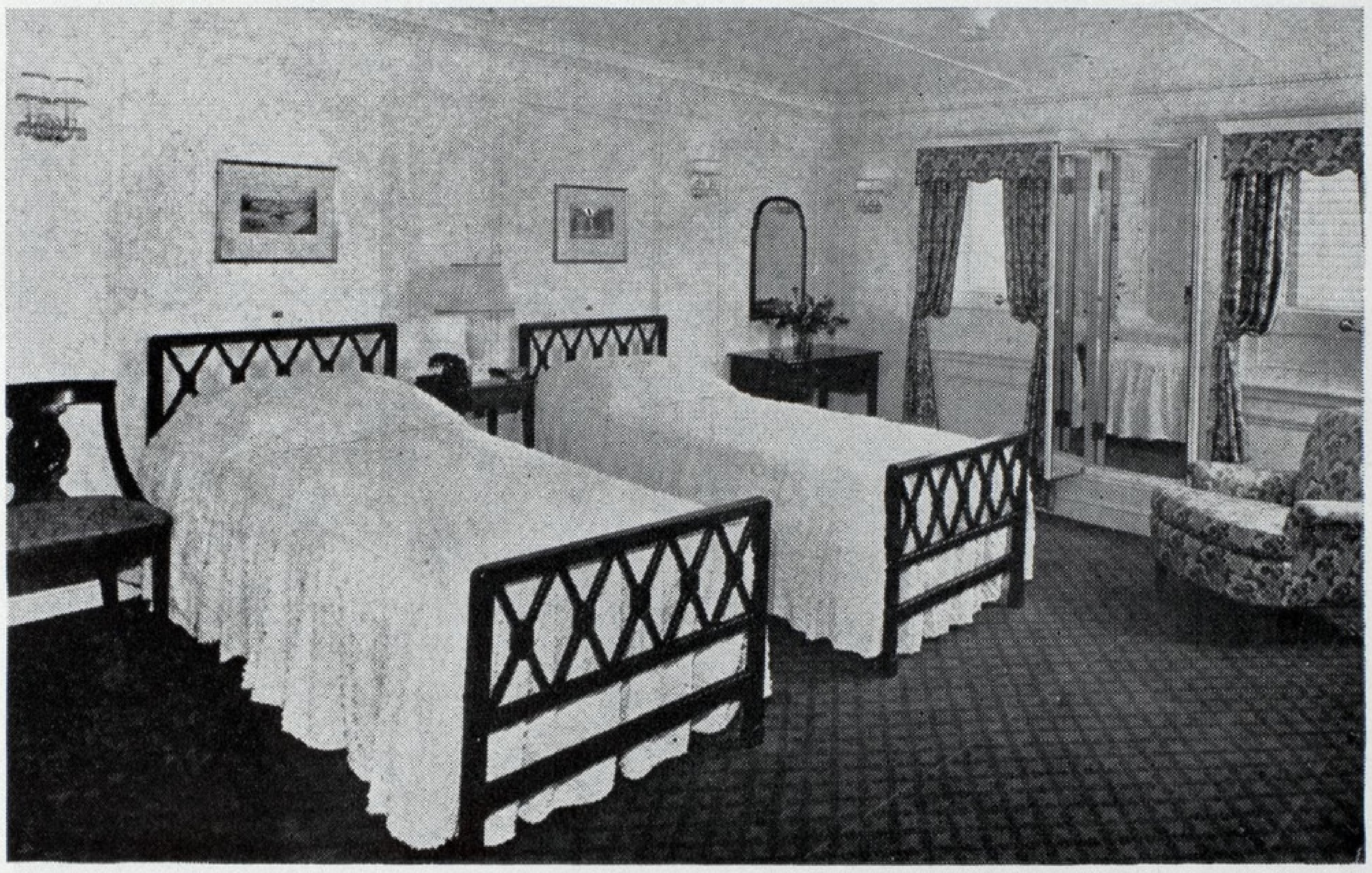
As a large number of the engine room auxiliaries are motor driven it was desirable to take advantage of the low water rate of the main turbines by connecting the auxiliary generators to the main turbines. These generators will handle the electric load down to 70 per cent of the main turbine revolutions without voltage change. At this speed, an automatic switch-over device shifts the load to a separate steam-driven auxiliary generator and disconnects the direct-connected generator with but very slight voltage variation.

When the main turbines are again operating at normal speed, the load is shifted by hand to the direct-driven generators.

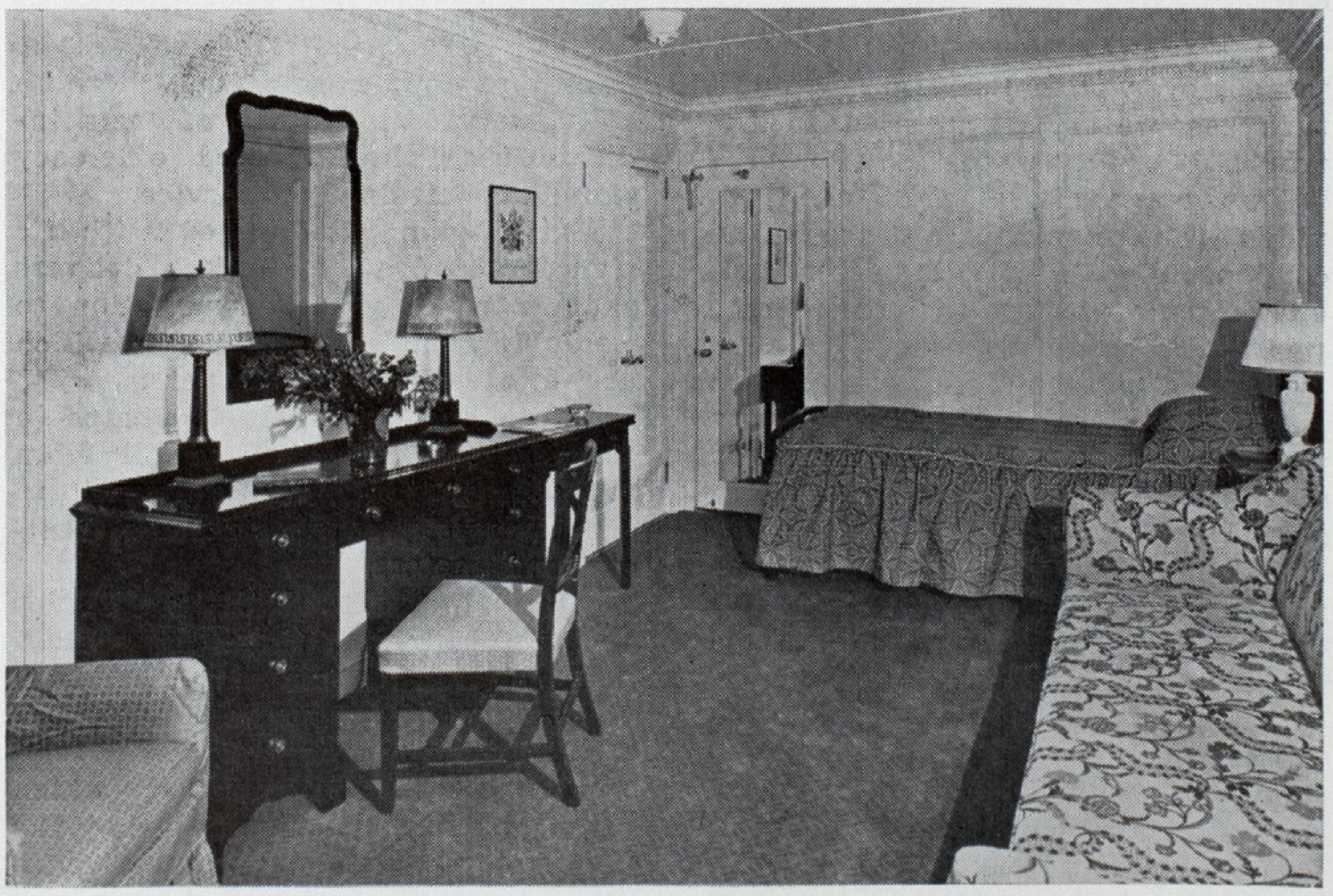
The reduction gears are of the



S. S. Santa Rosa — Suite Sitting Room



S. S. Santa Rosa — Suite Bedroom



S. S. Santa Rosa — Stateroom

double reduction type, consisting of two high speed and one low-speed unit, each in separate casings, the high speed pinions being placed vertically above the high-speed gears and the low-speed pinions being set at the sides of the low-speed gears. The main thrust bearing of the Kingsbury type is set at the forward end of the main gear shaft.

Steam from the main turbines is exhausted to the condensers, one under each low pressure turbine. These condensers embody all of the latest developments in condenser design and construction as applied to marine service, and the cooling surface is so arranged and cooling water so proportioned that a high vacuum, as required for economy of operation of the turbines, will be maintained, even with the high temperature sea water encountered in the tropics.

Bar S. S. Santa Rosa

Two stage air ejectors are provided for removing air from the condensers with inter and after coolers circulated by the condensate pump discharge.

Three motor-driven condensate pumps are located in the engine room; two to be used for ordinary steaming conditions and one for a standby.

The main circulating pumps, one for each condenser, are also motor driven and take their water from high and low suctions and are also provided with bilge suctions.

For feeding the boilers at sea, there are two main feed pumps, each of sufficient capacity to meet full power demands, one an electric motor-driven reciprocating pump, and the other a turbine-driven centrifugal pump. As these pumps are of large capacity, there is also an electric motor driven port feed pump of moderate capacity and a steam auxiliary reciprocating pump in the boiler room.

For supplying steam to the main turbines and steam-driven auxiliaries, there are four Babcock-Wilcox watertube boilers in one fireroom. These boilers were designed with ample combustion space and the burners located well clear of tubes so as to secure the best possible combustion conditions and minimize upkeep on brickwork. For the same reason, water wall tubes were also included in the boilers. To obtain a high boiler efficiency, economizers are used which reduce the temperature of the gases leaving the boilers to as low a point as is ecomically possible. Results of tests indicate that the expected efficiency should be attained in service.

Each boiler is supplied with its own forced draft fan which delivers the air required for combustion to a double front on the boiler in which are located five oil burners.

There are two fuel oil pumps in the fireroom which take oil from the storage tanks and deliver it to the burners through strainers, heaters and meters.

Although most of the auxiliaries are motor driven, there are certain of them that are steam driven, both for sea and port service.

With boilers operating at the temperatures and pressure at which these work, it is essential that the feed water be absolutely pure. Therefore, in designing and laying out the steam system, two distinct circuits were arranged, one which contains only clean steam or condensate and the other steam that may be contaminated with oil or impurities, and these two systems are so constructed as to be absolutely isolated at all times. As a further protection, all water entering the boiler must first pass through an evaporator.

Electric Generating Plant

Electrical energy is normally supplied by two 500 kilowatt 240-volt direct current generators, direct connected to the main propulsion turbines.

These generators are so arranged that they will maintain a constant voltage from full speed of the main engines to 70 per cent of full speed. Below this speed, the direct-connected generators are automatically cut out and two independent turbine-driven 500-kilowatt generators are cut in. This changeover is made with such rapidity that there is only a very small voltage change.

When the main turbines are returned to normal revolutions, the load may be shifted by hand back to the direct-connected generators.

By this arrangement, the generators will operate at sea with the economy of the main turbines which is considerably better than that of the independent units.

In addition to the four 500 kilowatt generators, there is also one 200-kilowatt 240-volt independent turbine-driven generator, for port use.

The main switchboard is located in the after end of the engine room and consists of several panels for generator connections, power distribution, lighting system and switching arrangements to connect the main board to the emergency board in the emergency generator room on the boat deck.

Engine telegraphs are located on the bridge and in the engine room. There are two sets of transmitters and indicators on the bridge, each set consisting of a transmitter and reply indicator for the starboard shaft, and a similar arrangement for the port shaft, mounted on a common pedestal. One set is located on the port side of the bridge and the other set on the starboard side. Orders can be transmitted from either side of the bridge to the engine room for either shaft. In the engine room are two indicators and reply transmitters, one for each shaft.

A mechanical docking telegraph operates between the bridge and the after docking bridge. In the same system is also included a steering telegraph in the steering gear room and the dials are marked so that the telegraph may be used for either docking or steering.

There is also provided a bridge loud speaking telephone system for communication between the bridge, after docking bridge, steering gear room, engine room and chief engineer's room. Voice tubes are also provided between several stations such as standard compass and steering compass, captain's room and wheel house, wheel house and radio room, etc. There are also other interior communicating systems for the safety of the ship and convenience of the passengers.

A complete telephone system has been installed with a telephone in every stateroom and in many of the officers' rooms, as well as public spaces and other locations.

Distributed about the ship in various locations are some 22 secondary electric-driven clocks, controlled by a master clock in the chart room.

The ship's wireless equipment consists of a 500-watt tube type transmitter for intermediate and short-wave telegraph transmission, power being supplied from the emergency generator switchboard, and one 50-watt emergency intermediate wave tube transmitter, operated from a storage battery.

Moving pictures will be shown in the main dining room, the projection being done from the room at the forward end. There are two projection machines with sound producing apparatus, all of the latest type. The pictures will be thrown on a portable screen, set up in front of the large painting on the after wall of the main dining room. The sound producer is located along side of the screen and is controlled from the projection room.

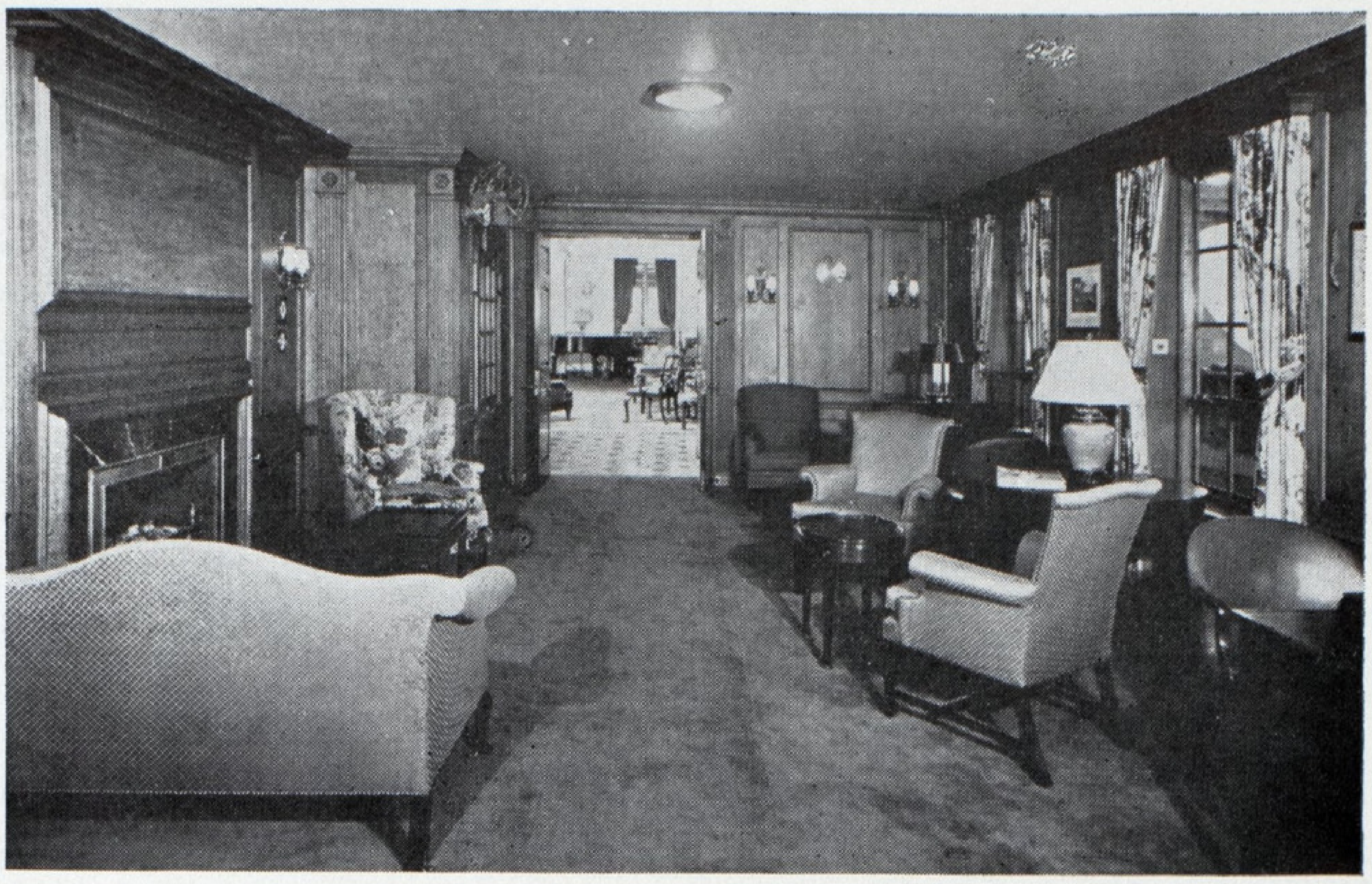
In order to provide entertainment and also for making general announcements throughout the ship, a complete and especially designed public address system has been installed.

Refrigeration, Heating, Ventilating

For cooling the various refrigerator rooms and refrigerator boxes, there is provided a refrigerating plant consisting of three carbon dioxide compressors, condensers, brine coolers, and circulating pumps for brine and sea water, with necessary gages and thermometers.

Due to the different kinds of cargo that will be carried, and the widely varying outside temperatures encountered on different trips and at different times on any one trip, the refrigeration plant has been designed with sufficient capacity for the most severe conditions that may be encountered. Consequently, under normal conditions, only a part of the plant will be in operation.

As these ships will operate, both in latitudes as far north as New York in the winter time, and also in the tropics, very complete ventilating



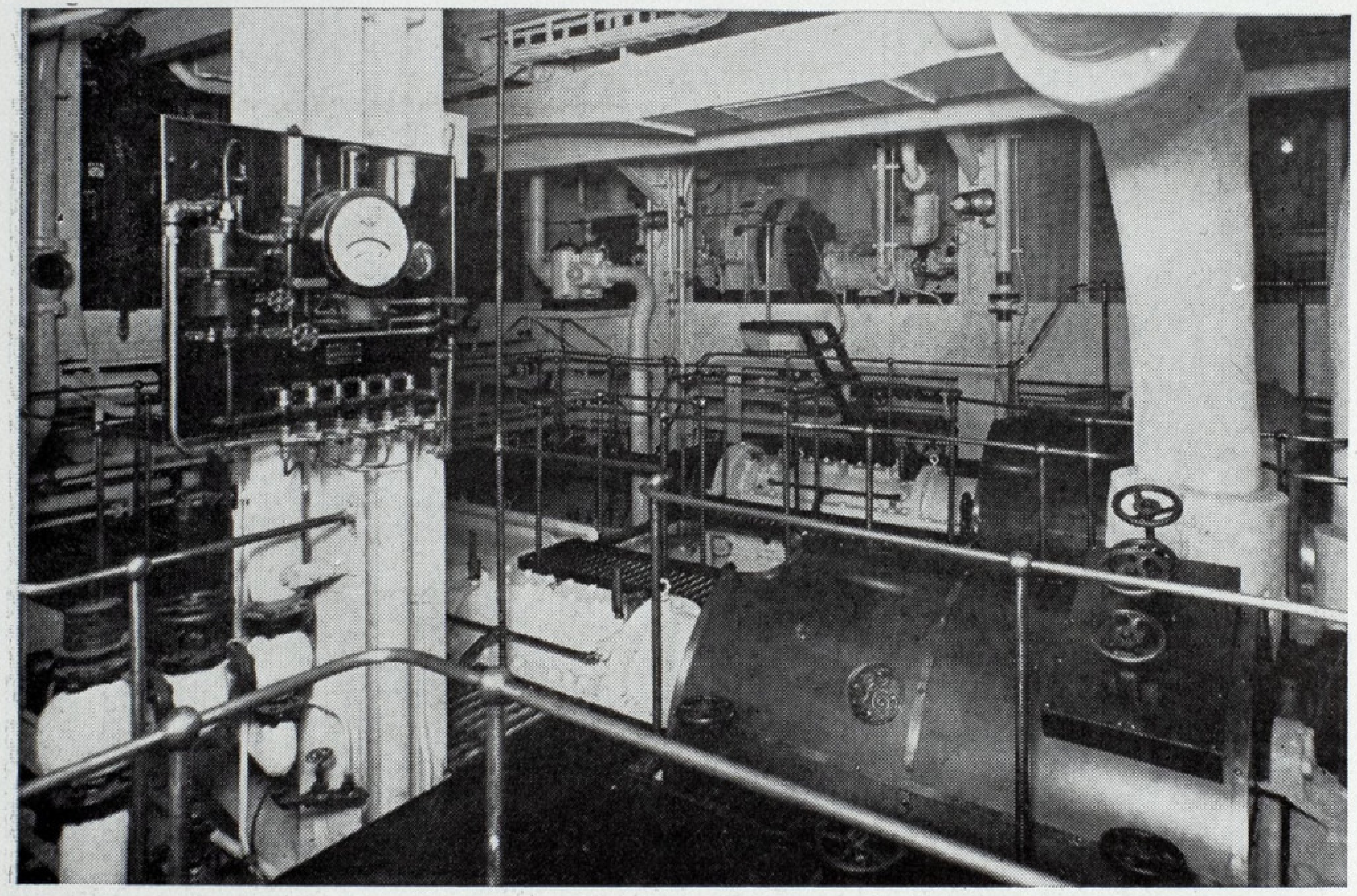
S. S. Santa Rosa — Library

S. S. Santa Rosa — Dining Room

S. S. Santa Rosa — Lounge

and heating systems have been installed throughout, consisting of both mechanical supply and hot and cold air; mechanical exhaust systems and natural supply and exhaust systems.

In such spaces as passengers' staterooms, dining salons, main foyers, library, lounge, crews' quarters, barber shop, gymnasium, and carpenter shop, even though many of these spaces have excellent natural ventilation, a mechanical system will supply both hot and cold air in sufficient volume to make frequent changes. In certain other spaces, such as the galleys, which will normally be warm, cold air only is applied mechanically. Certain machinery spaces and also some of the cargo spaces where perishable fruits may be carried are also supplied with fresh air by mechanical means.



Engine Room S. S. Santa Rosa

In addition to the mechanical and natural ventilation systems, there are over 200 electric bracket fans located throughout the passenger quarters, public rooms and crews' spaces.

As the passenger quarters are on two decks and the general living spaces on the third deck, access to and from decks is comparatively simple and no elevators are provided for passengers.

For handling cargo and for the use of ship's personnel, five Otis elevators have been installed, two forward, one amidship and two aft. The two elevators forward are each approximately 6 x 8 feet and have a capacity of two and a half tons. They operate between C deck and the lower holds. At C deck level these elevators discharge into an athwartship passageway which communicates with large sideports. The elevator amidship, 5½ x 6 feet, of one and one half tons capacity, can be used by ship's personnel and also for moving refrigerated cargo. This elevator travels from the boat deck to the lower cargo hold, communicating on the C deck level with an athwartship passageway leading to large sideports through which cargo may be brought into the ship. Elevators 4 and 5 serve a number of the after cargo spaces from which cargo can be brought in and out through large sideports at the C deck levels, these ports being of sufficient size to allow an automobile to pass. All of the elevators are of the latest design for shipboard use and have the usual automatic terminal stops to bring them to rest at the limits of travel.

The steering gear is of electric hydraulic type, operating rams in hydraulic cylinders, the crossheads on the rams working directly on the rudder crosshead. Oil is the liquid used in the system and is supplied by duplicate sets of electric motor-driven pumps, each set being capable of operating the steering gear properly with the vessel proceeding at full speed. The steering gear is controlled from the wheel house through a hydraulic telemotor with follow-up gear.

A variable speed electric motor drives the windlass through combined worm and wheel and spur gears, and is capable of hoisting the two bower anchors and sixty fathoms of chain simultaneously at a rate of 20 feet per minute.

A motor driven capstan is located aft on B deck. It is capable of pulling 27,000 pounds at a rope speed of 30 feet per minute, and a speed of 90 feet per minute with slack line.

There are 14 cargo winches, 10 forward and 4 aft. These winches are motor driven with worm gears and are quiet in operation. Of these, 10 are rated at 3 tons and 4 at 5 tons, and they are capable of handling their loads at 145 and 160 feet per minute. Control equipment is of full magnetic type with automatic acceleration on the last two points, and both solenoid and foot operated brakes are provided.

Lifeboats, Davits and Navigation

On the boat deck are seven metallic lifeboats with a capacity of 60 persons each and one motor lifeboat with a capacity of 54 persons. These boats are fitted with releasing gears and in every other respect fully comply with the requirements of the steamboat inspection service and the classification societies. They are stowed inboard under Welin quadrant mechanical davits, and are so arranged that by using tripping chocks it is possible to launch them without the use of power for taking in the falls. To get the boats inboard after being lowered, two power winches are provided on the boat deck, one on either side, with suitable niggerheads to which boat falls may be lead.

There is installed a Sperry gyro system consisting of one master compass, one steering repeater compass, one located in the wheel house and one on the after docking bridge. A bearing repeater compass on a pelorus stand is located on top of the wheel house. There is also a repeater for the radio direction finder and other necessary equipment, such as motor generators and switchboards with an alarm system in the wheel house to indicate the failure of the repeating system and also an alarm buzzer to indicate the failure of the ship's electrical supply system.

In addition there is a Sperry gyro pilot and electric steering control operated from the master gyro compass for controlling the movement of the rudder. This unit is arranged with the usual clutches so that the system may be operated either directly or by hydraulic telemotor steering gear as desired.

An emergency lighting panel is located in the emergency generator room on the boat deck and is normally supplied from the main generators. Connected to it is a storage battery of suitable size and voltage and a diesel-driven generator. The system is so arranged on the panel that in case of failure of the main generators in the engine room, the panel will be immediately energized from the storage battery and will continue on the storage battery as long as the main generators are off or until the emergency generator is started. The radio equipment is also supplied from this emergency panel and by this arrangement the gyro compass, the emergency lights and the radio equipment will be en-

ergized at all times either from the main generators, the storage battery or the emergency generator.

To show the direction of rotation and the revolutions per minute of each shaft, a shaft revolution indicator system is provided with indicators on the bridge and in the engine room. Another aid to navigation is a rudder end indicator fitted on the bridge for indicating the position of the rudder.

A radio direction finder is installed for assisting in the navigation of the ship, and this is operated in connection with the radio apparatus, and for accuracy of reading is also provided with a gyro repeater compass.

There is also a fathometer, electric depth sounding apparatus, for sounding from 3 to 130 fathoms, and in addition, a motor-driven electric sounding machine.

Watertight Door Equipment

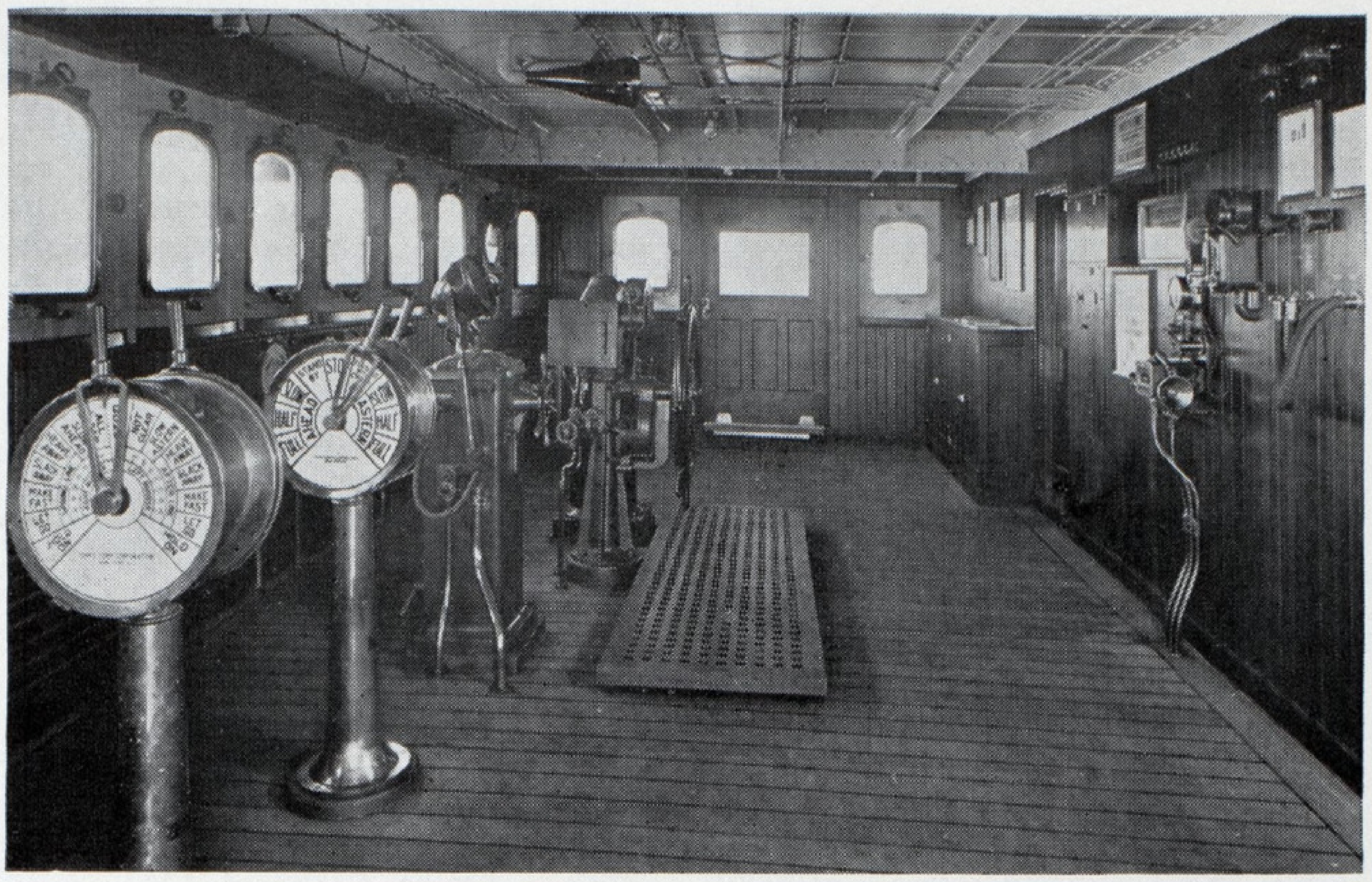
In certain locations on the ship, it is necessary to provide openings through watertight bulkheads, as for example, between the engine and fire rooms. To insure the safety of the ship in case of accident, these openings, eight in number, are fitted with power-operated watertight doors.

These doors can be closed from the wheel house or operated locally, and are so arranged that when closed from the wheel house, they can be opened locally by a lever on the door control valves—the door remaining open as long as the lever is held in the "open" position, but will reclose automatically when the lever is released by a person passing through the door. By this means, a person trapped in a compartment may, after the doors have closed, escape and yet the compartment will be again sealed automatically after his escape.

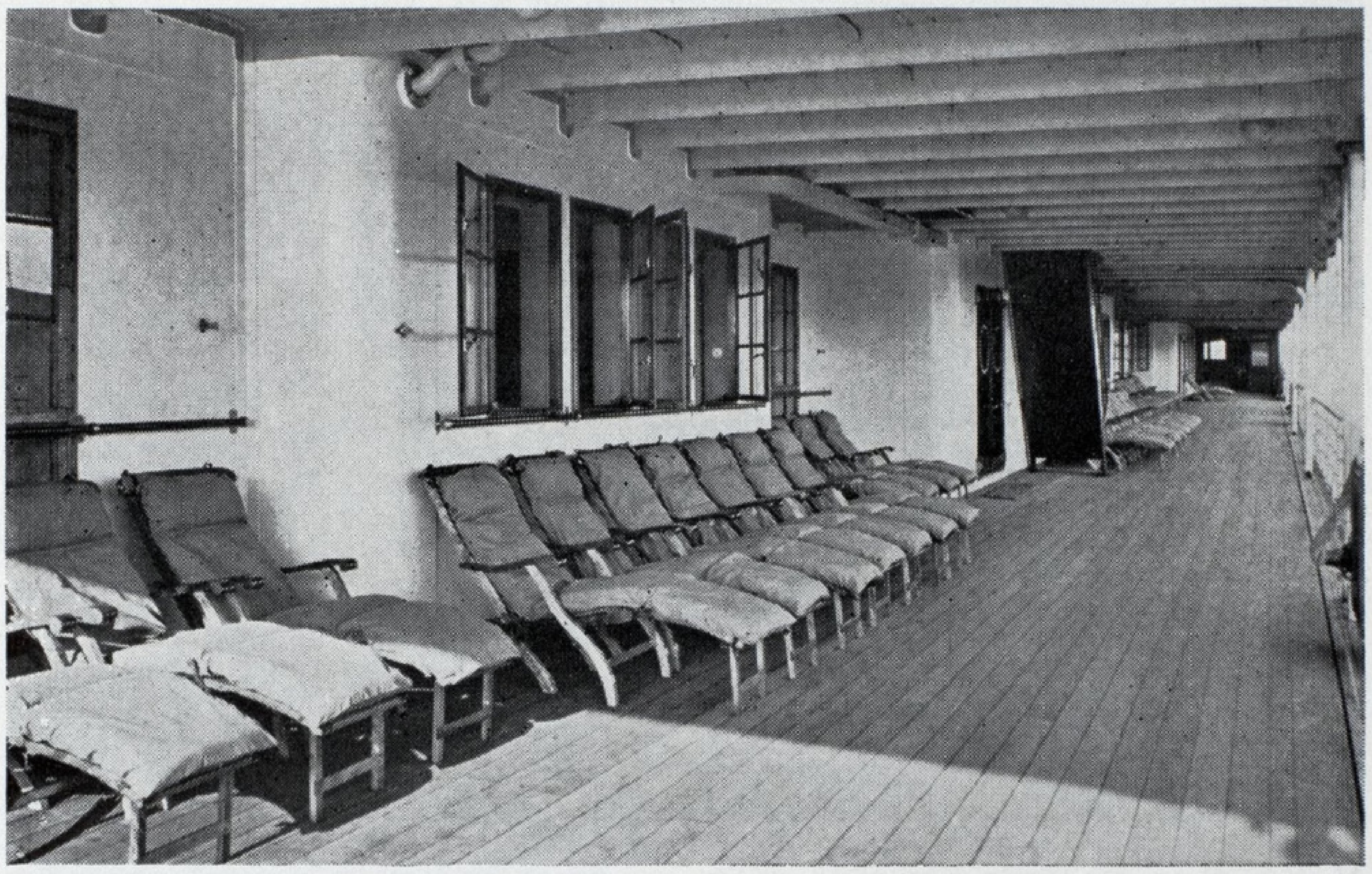
Although all doors may be closed from the wheel house, they can only be opened from the local stations. To indicate at the wheel house whether a door is open or closed, an electric panel is provided showing the condition of every door. The doors are operated hydraulically from an accumulator to which liquid is supplied at an appropriate pressure by one of a pair of pumps, particularly designed for this service, and the accumulator is of such size that once charged, the doors may be opened and closed a number of times, even if the supply pumps fail to function.

Among the various safety features on the ship, the hydraulic bilge valve control system is of particular interest. For emergency bilge pumping, there is provided in the engine room a self-priming submersible motor-driven bilge pump, which is energized from the emergency generator switchboard on the boat deck.

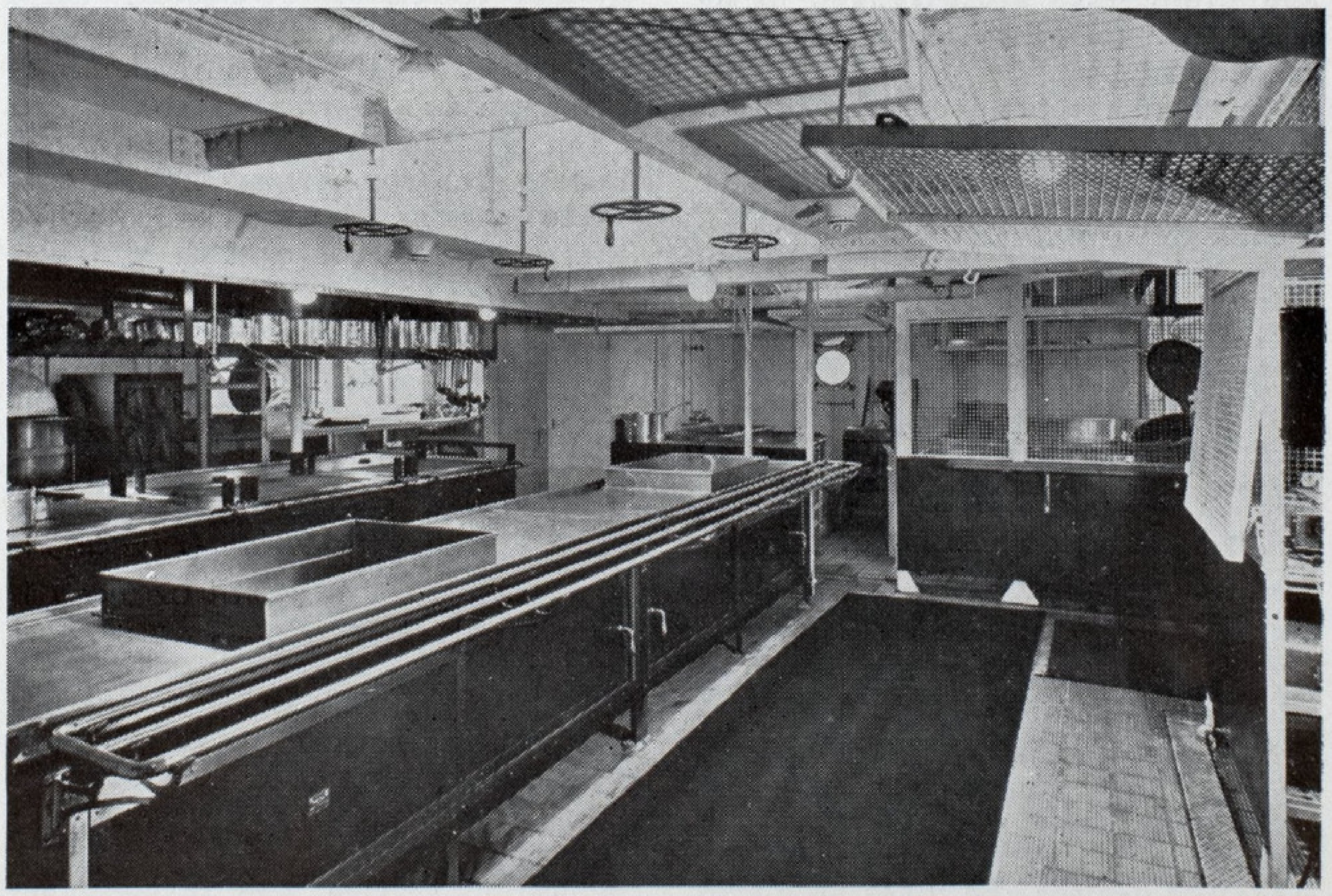
In every lower compartment of



S. S. Santa Rosa — Bridge



S. S. Santa Rosa — Promenade Deck



S. S. Santa Rosa — Galley

the ship are located these hydraulically-controlled valves so arranged that they may be opened or closed locally by hand, or opened or closed hydraulically by remote control, regardless of the position of the valves as set locally. The operating panel for these valves is located just outside of the emergency generator room on the boat deck. These hydraulically-operated valves are also a part of the regular bilge pumping system of the ship on which other bilge pumps may be used, but the system is so arranged that in case of an emergency, the entire control is in the hands of an operator at the panel on the boat deck.

In order to provide additional safety against flooding of various compartments, a considerable number of the scupper valves on soil and drain lines are arranged to be opened or closed by hand gear, and in addition, can be closed hydraulically from a central control station in the dummy stack.

In connection with the power-operated watertight door system, there are four hydraulically-operated stop valves on the boilers. These stop valves may be opened or closed locally by hand, but in addition, they may also be closed hydraulically from an emergency station on C deck, remote from the boiler room.

Fire Detection, Extinguishing

In addition to the fire detection system, there is fitted a complete automatic fire alarm, complying in all respects with the latest requirements of the steamboat inspection service. This system is operated electrically upon a predetermined rise in temperature on any of the signaling devices and gives an alarm in the wheel house. Each circuit in this system is also provided with a "break-the-glass-type" box for manually transmitting the alarm.

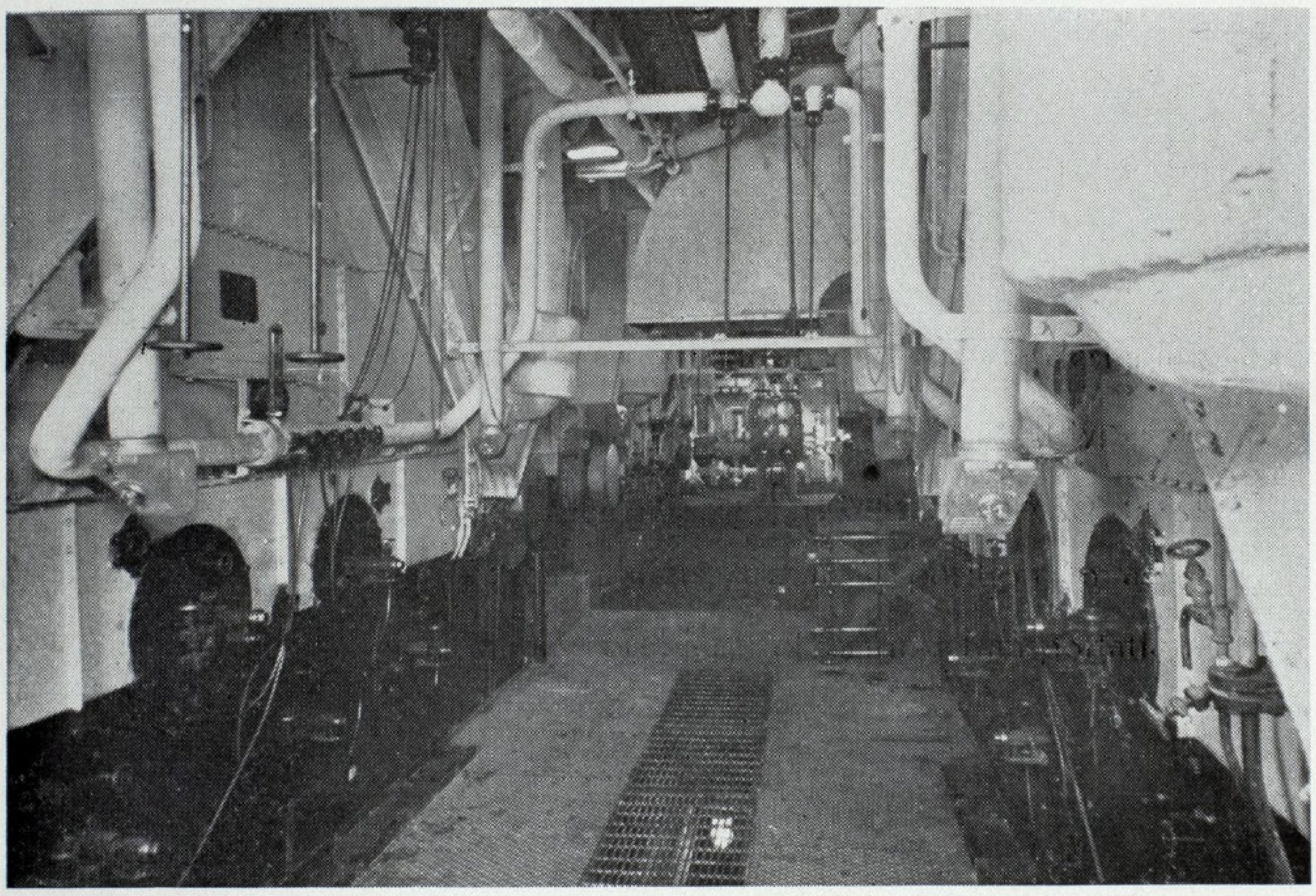
In case of fire in compartments above the bulkhead deck, it is essential to limit the travel of the fire. For this purpose, the various spaces are broken up into a number of compartments, separated by substantial fire-screen bulkheads constructed to comply with the requirements of the international convention of safety of life at sea, 1929. Openings through these bulkheads are fitted with properly constructed fire-screen doors. Fire-screen dampers are also fitted in ventilation ducts, passing through these bulkheads, so arranged that they may be operated from either side of the bulkhead or above the deck.

To detect the presence of a fire in any of the cargo holds, paint rooms, lamp rooms, etc., a detecting system is fitted which immediately shows the presence of smoke in an indicating cabinet in the wheel house, each compartment being connected by a separate indicator so that the exact location of a fire is instantly known.

In addition, these various compartments are connected with a carbon dioxide distributing system for extinguishing fires, operated from two distributing manifolds. Certain other spaces are connected for fire detection only; still other compartments are also fitted with portable carbon dioxide fire-fighting apparatus.

A complete salt-water system of fire fighting is also installed with firemains and risers and outlets and hoses, so arranged as to comply with all requirements of the steamboat inspection service, and in sufficient number so that all compartments within the ship may be reached by not more than 50-foot length of hose. An appropriate pressure of water is maintained on this firemain system at all times. Portable fire extinguishers are also provided in all compartments.

A general alarm system is installed throughout the ship, which operates bells through a controller in the wheel house. These bells will ring continuously or intermittently as desired.



Boiler Room S. S. Santa Rosa

Colombia Enters Service

The COLOMBIA recently completed passenger and cargo liner, for the Colombian line, was scheduled to begin regular service out of New York on Nov. 24. The ports of call include Port au Prince, Haiti; Kingston, Jamaica, Cristobal, Canal Zone; Barranquilla, and Cartagena, Colombia; and Panama. The time to Cristobal is eight days.

All staterooms are outside rooms and the tile swimming pool on the sun deck is surrounded by pleasant verandas. A special feature is the air-cooled and air-conditioned dining room. The COLOMBIA will be followed in service by her sistership the HAYTI, now nearing completion. These two ships built by the Newport News Shipbuilding & Dry Dock Co., at a total cost of $5,000,000, have been designed by the New York naval architect, Theodore E. Ferris. They are especially suitable for operation in tropical waters and are fully equipped with the most modern developments to assure safety and comfort to passengers.

The Colombian line has also chartered the United Fruit steamer, PASTORES of 7241 tons, to enlarge its service and to maintain a weekly sailing schedule.

To Command Furness Liner

Capt. H. Jeffries Davis, commodore of the Furness-Bermuda line, who has been master of the company's flagship MONARCH OF BERMUDA since that vessel entered the New York-Bermuda run in November, 1931, has been appointed to the command of the new flagship, QUEEN OF BERMUDA, which is now receiving her finishing touches at Barrow, England, and will enter the Bermuda trade out of New York next February. Captain Davis sailed for England Nov. 18 to stand by his new command.

Capt. A. R. Frances, who has been staff captain of the MONARCH, will succeed Captain Davis as master. Both men are among the best known shipmasters sailing out of New York, and they have commanded and served as officers aboard a number of Furness liners in the Bermuda run for a number of years.

NAVAL ARCHITECTS

Hold Fortieth Annual Meeting

THE fortieth annual meeting of the Society of Naval Architects and Marine Engineers was held in New York on Nov. 17 and 18 with J. Howland Gardner, president of the society, presiding. It was in every respect one of the most successful meetings in the history of the society. The technical sessions were particularly well attended and the liveliest interest was taken in the papers and discussions. The high technical standing set by the society was fully maintained. The world will know from the high quality of the papers presented, both in the treatment of theory and practical application, that the United States is prepared to take a leading part in the future development of the design and construction of ships.

An abstract of the address by President J. Howland Gardner at the opening session, Nov. 17, follows:

Address of J. Howland Gardner

THIS country has about completed an extensive shipbuilding program. You can look back with pride and satisfaction at the outstanding achievements of the last three years. You have designed and constructed, or have in process of construction, in American shipyards 42 modern ocean vessels, and in addition have rebuilt, reconditioned or nearly completed 37 others.

The new merchant vessels that you have built, are ship for ship in operating efficiency and safety at least the equal of those constructed anywhere in the world. These vessels not only comply with, but in many respects exceed the criterion of safety laid down by the international convention of 1929 on safety of life at sea. The subdivision by watertight bulkheads exceeds the international requirements.

These modern vessels built and to be built constitute a substantial nucleus for an American merchant marine in foreign trade and will operate on 45 trade routes.

This strengthening of our position in the foreign trade and the improvements in our merchant shipping now in contemplation have been or will be the direct result of the merchant marine act of 1928. The mail contract provisions of the act alone have resulted in orders for 30 combination passenger and cargo vessels—the last of which will be completed early next year; and will require from 28 to 36 additional vessels by 1940.

The continuation of this progress and the very life of our foreign trade requires the continuation of the act on the statute books. We are pleased to record that this construction has already resulted in furnishing constant employment over a period of three years to approximately 25,000 men in the shipbuilding and allied industries.

On the other hand, unfortunately, the general outlook for shipbuilding in the immediate future is not bright—14,000,000, tons or nearly 20 per cent of the world shipping now is idle, and immediate orders for new seagoing ships could scarcely be expected.

J. Howland Gardner

Coincident with the depression in merchant shipping is the reduction in world armaments through international treaties with its effects upon naval building, and the private shipbuilding industry is further affected because of the construction of a much larger percentage of naval vessels in navy yards than existed in pre-war days.

Eliminate Government Competition

There has been a constant increase in this government competition with public shipyards. Previous to the World war, 80 per cent in value of all naval vessels were constructed in private yards, and 20 per cent in navy yards. Since the war this percentage of construction work done in navy yards has increased two and a half times.

The direct competition of the government with private shipbuilding industry is not confined to that part of the work ordinarily performed in the shipyard, but extends to the manufacture of materials and equipment formerly furnished by allied industries.

A committee of congress now is engaged in investigating the effect of government competition with private industry. It is earnestly hoped that the facts developed by this committee will be understood and conditions remedied.

We can predicate the future only by a careful analysis of the past, and if history means anything it is evident that privately-owned shipyards are a national asset, and they must have continuity of work in order to keep in efficient operation. This continuity of work could be greatly assisted by a wise distribution of naval construction to our private yards.

Something could be accomplished along this line at the present time. You will recall that as far back as 1916 congress authorized the construction of 12 destroyers. Of these 6 already have been awarded to navy yards and only two to shipyards owned privately. I understand that money is available to begin the construction of three others. If the government would authorize the work on these three vessels to proceed in the privately-owned shipyards it would go a long way in assisting these yards to bridge over existing conditions of serious unemployment.

Replacements Must be Made

Twelve per cent of our entire seagoing merchant fleet is more than twenty years old, while the wartime-built vessels operating in our foreign trade are most of them from thirteen to fourteen years old. Replacements must be made.

I am quite sure you will agree that the average volume of traffic for the years 1922 to 1928 may fairly be considered as representative of normal conditions. On this basis a conservative estimate of the probable future annual demand for our merchant shipping to maintain the normal volume of trade would call eventually for the construction of 210,000 gross tons of merchant vessels of various types and 130,000 gross tons of tankers, or a total of 340,000 gross tons per year.

While it is true that the shipyards are passing through a period of greatly reduced activity, it also is evident that so long as the merchant marine act stands, a return to normal conditions must necessarily result in increased shipyard employment.

The idle wartime-built ships owned by the government and which have never been put into service are a menace to the construction of new vessels and a program that will dispose of them at the earliest practicable date is important.

We should at this time commend the United States shipping board for its recent action in withdrawing from documentation 124 obsolete vessels aggregating 1,000,000 deadweight tons—a long stride in the right direction.

I am sure you all are in full accord with a reduction of world armament. There is a point, however, beyond which a country cannot proceed with safety. The United States, Great Britain and Japan established by the London treaty that their naval strength should be represented by the ratio of 5-5-3. Since that time Great Britain and Japan have carried on a continuous replacement program and maintained their fleets approximately to treaty standards. Unfortunately the United States has not followed their example. On account of the age of our ships we have slipped down to a position where we now are about on a parity with Japan.

In order for the United States to attain treaty strength we must build approximately 118 naval ships with a total of 287,330 tons.

This condition cannot be allowed to continue and regardless of the results of the pending Geneva conference the policy of the United States should be to proceed with a continuous building program to replace our older naval ships to the end that we may continue to have a modern and efficient navy for national defense.

Needed for National Defense

In all questions affecting a reduction of naval armament the merchant marine as a naval auxiliary must be considered and thoroughly understood. As naval strength is reduced the value of the merchant ship as an auxiliary is proportionately increased. Carried to its logical conclusion, if the world navies were eliminated the merchant fleet automatically would become the navy.

A survey of the merchant tonnage of the principal maritime nations develops some most interesting figures; for vessels of not less than 560 feet in length, 18 knots or over, the United States has about one half as many as Great Britain; for vessels of not less than 450 feet in length and about 16 knots speed, the United States has 23 and Great Britain five times as many; for vessels of not less than 420 feet in length and about 12 knots, the United States has about 70 and Great Britain nearly six times as many; of 12-knot ships less than 420 feet in length, Great Britain has eight times the tonnage of American vessels of this type. Every ship here listed is capable of being transformed without undue delay into an efficient naval auxiliary.

The world industrial depression has not prevented maritime nations other than our own from providing for their commercial future on the seas. Not only did their rehabilitation program of ships of all classes begin long before 1928, when the first constructive measures were undertaken in this country as the result of the Jones-White act, but it has extended through these years of depleted industry. Today, in spite of our start since 1928, we face the future with a merchant fleet nearly 90 per cent obsolete.

Merchant Fleets Modernized

Germany has rebuilt her merchant marine until today she stands in a position of commercial independence on the high seas with a merchant fleet featuring the superliners Bremen and Europa. England has prosecuted an unceasing program of rehabilitation and she too faces international trade revival with confidence in her ability again to assume a preeminent position in the world trade routes. The new 75,000-ton Cunard liner, under construction, will be the flagship of the British merchant marine. Italy and France have their contenders for blue ribbon honors in the North Atlantic; Italy with the Rex and Conte Di Savola, and France with the Greatest superliner yet to be undertaken, the Normandie. These are but the high spots in a general realization abroad of the importance of prestige and ability to meet commercial demands with modern ships.

The picture of the obsolescence of the American fleet in relation to those of other nations may be summarized as follows: On July 1, 1932, only 9.6 per cent of our merchant fleet in ships of 2000 gross tons and over had been built since January 1, 1922. In comparison with the fleets of other maritime nations during this same period, 56.3 per cent of Norway's fleet is new; Germany's fleet consists of 55.9 per cent modern vessels; Great Britain, 50.9 per cent; Holland, 50.2 per cent; Sweden, 50.1 per cent; Denmark 47.8 per cent; France, 37.1 per cent; Italy, 28.6 per cent, and Japan, 23 per cent. Evidently the peoples of those nations are aware of the part which an economical modern merchant fleet plays in their welfare, both commercial and naval.

Unless, to begin with, a definite and organized program of ship construction is formulated, that will carry on from the excellent nucleus established by the merchant marine act of 1928 this nation will again in the not distant future be obliged to depend upon foreign-flag ships to carry the preponderance of our goods.

Program of Ships to Build

Where is this program? Upon whose shoulders rests the task of formulating it? Logically this is a problem to be solved by united effort and cooperation between the naval architects, shipbuilders, owners and operators. The American merchant marine and foreign trade cannot grow without government aid. This has been fully recognized by congress and established as a principle of governmental policy, but unless there can be agreement within the industry as to the essential requirements of the various classes of service effectively to meet foreign competition on the trade routes of the world we will once more see our merchant marine occupying an unimportant position in world trade.

In our progress towards merchant fleet rehabilitation during the past three years, we have, through the ability of members of this society, designed and built ships which individually in economy and performance are outstanding among the vessels of all nations. Our weakness does not lie in this direction. The engineers and artisans of no nation can surpass us in the science of shipbuilding. What we do lack is a program of ships to build.

The lesson of the war, that as a nation we must be self-sufficient on the seas, has evidently been lost to the people of the country. We must continually strive to renew that lesson. If we accomplish this, there will be a program and there will be ships.

Technical Papers Presented

SIXTEEN papers were presented during the two days' meeting of the society, Nov. 17-18. These papers and complete discussions will be published in full in the transactions of the society, which will be ready for distribution in June, 1933. Titles and names of the authors of these papers and brief abstracts follow:

1 **Trial Analysis Methods,** by Lieut. A. S. Pitre, (CC) U. S. N., visitor. In this paper, the author, who is attached to the United States Experimental Model Basin, Washington., has outlined methods of procedure for reconciling the data obtained by model experiments with the results obtained on standardization trials of

the completed ship. The real value of this work lies in the possibility of thus anticipating from model experiments more accurately the final performance of the ship itself.

As the author points out, it is usual practice in any new design to run model experiments for determining the necessary propulsive characteristics. As a result of such model tests a particular combination of lines and propeller is selected and translated into the full scale. When the ship is completed standardization trials are held to obtain actual speeds and power. It is natural to assume that the factors predicted in the model basin experiments should be confirmed when the ship is run on trials. The author then asks why should measured trial results differ from model results, assuming that the model predictions are correct. He answers this question by pointing out that in any comparison it is necessary to establish a standard in attempting to reconcile the differences between model results and measured trial results, and suggests the adoption of a set of standard conditions because of necessarily entirely different conditions prevailing in each instance.

To provide a means for correcting the effect of those influences surrounding a ship on a trial course which do not prevail under the carefully regulated conditions of model trials, two methods have been devised. One of these methods is that devised by Capt. E. F. Eggert in charge of the United States experimental model basin, and the other by Mr. Schoenherr of the model basin staff. He proceeds with a comparative calculation to indicate the character, use and results attainable by these two methods.

The author's conclusions are that since the analyses he presents, based on the reduction of the measured data in the case of the trials under consideration, are consistent both with the facts surrounding each trial as well as with model basin predictions these methods will give satisfactory comparisons between experimental and trial results. He then outlines the various steps necessary to carry on such comparisons, the general feature of which is that it is essential to reduce the measured data down to model conditions before comparisons are made.

2 Measurements of the Propulsive and Structural Characteristics of Ships, by Dr. Gunther Kempf, member.

As director of the Hamburg model basin, Hamburg, Germany, the author has contributed much valuable information for the improvement in ship design and particularly in the use of model experiments to attain such improvement.

His paper will, therefore, be read with the greatest interest by everyone seeking to find firmer ground for anticipating and accurately predicting results from experimental data and carefully conducted scientific investigation on full sized ships.

Technical improvements, the author states, in the forms of ships and their propulsion and in hull construction are possible only if the demands which must be fulfilled and the fundamental requirements for their calculation are accurately known. It is a well known fact, he says, that the variation in the propulsive efficiency of different vessels belonging to the same owner may be of the order of 30 to 40 per cent. The maneuvering qualities will vary sometime over 100 per cent, and up to the present time, probably no one has learned the real value and distribution of the stresses in the different parts of the ship's hull in a heavy sea. In all these respects, the author points out, many gaps still exit in our knowledge, and there is, therefore, a real necessity for sufficient and exact measurements of this kind on ships.

He then goes on to say that if these gaps could be filled and if accurate data could be secured for study for calculating the propulsive and structural characteristics of ships after they have been measured in a sufficient number of cases the outlook for progress in naval architecture will be bright.

He then proceeds in his paper to outline the experiences of the Hamburg tank in carrying out such measurements also bringing out that without great expense and trouble every shipowner can, and should, carry out as many measurements as possible on his ships, and that publication of such data would be of great value to the industry as a whole.

In this paper he discusses specifically the problem of accurately measuring speed and the satisfactory results obtained by the log developed under his direction. Similarly he touches on the accurate determination of revolutions, power, wind, resistance, additional resistance, thrust, properties of maneuvering, deflection of the ship, strains, vibrations and accelerations and temperature.

In concluding, Dr. Kempf emphasizes that all of this work requires not only the co-operation of those concerned, but also much experience and organization, because it must be controlled, if not guided by a neutral body interested in getting at the real facts. He believes if the work is guided by the true technical spirit, such measurements could be of immense value for further improvements in shipbuilding.

3 Propeller Cavitation, by Capt. E. F. Eggert, (C) U. S. N., visitor.

The author is in charge of the United States experimental model basin, Washington. He begins his paper by saying that it presents the useful results of the first two years study of propeller testing in the water tunnel of the United States experimental model basin. Many propeller tests have been made, the analysis of which pointed to improvements necessary in the apparatus and these have been made from time to time. During the summer of 1931, a considerable period was spent in rebuilding the tunnel and apparatus with the purpose of obtaining smoother waterflow, more reliable measurements and more convenient operation. The essential principles of the water tunnel have not been affected by these changes. Some difficulties still remain, but it is hoped in time to reduce their importance.

Captain Eggert points out that the chief effect of cavitation for which the model basin has watched for years past, has been the accompanying increase in power required at a given speed. Also, that improvement in the technique of self-propelled model testing has brought to light more significant differences, at high speeds, between the results of trials and the indications of the models. Subsequent investigation has fully confirmed that these differences, which were from the first ascribed to cavitation, are in fact due to cavitation.

In his paper, the author discusses kinds of cativation, the criterion of back cavitation, blade interference, ship tests, application of formula, vapor pressure in the water and further developments. In the appendix of the paper cavitation is defined and a mathematical interpretation is given. In the second part of the appendix, a practical illustration is given of the use of the formula suggested.

4 Tests on Three Geometrically Similar Ship Models, by Commander H. E. Saunders, (CC) U. S. N., member.

The author is attached to the United States experimental model basin, Washington. This paper represents the results not only of a great deal of experimental work, but also an exceptionally wide research into the authoritative literature on this subject. It is, therefore, a contribution of more than ordinary value to the science of naval architecture. As indicated in the title, the paper is concerned with demonstrating in a practical manner the accepted theory of similitude. The main theme of the paper may best be defined by quoting here the author's introduction, in which he says:

The extrapolation of model results to full scale, by the theory of similitude or otherwise is a most important part of any model research procedure. The value of model research is directly proportional to the accuracy and reliability with which this extrapolation can be performed. En-

terprising experimenters consistently endeavor to reduce the hazards of extrapolation by the development of methods which will bring the full scale extrapolated values within narrow confines whose borders may be fixed by special tests and calculations.

Nevertheless, excluding instrumental and observational errors, discrepancies in predicted results in full scale performance continue. They arise largely from questionable assumptions in model test procedure, from incorrect methods of extrapolation, or from questionable data in ship trials.

One natural solution of this problem, the author points out, is to check the predicted results by duplicating the model on a different scale, or to use a series of geometrical similar models as a means of defining more closely the region in which the extropolation results may be found.

This paper has been prepared, the author states, primarily to furnish the results of the complete tests of a geometrically similar series of ship models, all of which have been self-propelled, and for which reasonably dependable and accurate ship trial data are available, and to give a comparison of these model tests with actual ship performance. A secondary aim of the paper is to set forth in detail the complete procedure for working up resistance and self-propulsion tests now in use by the United States experimental model basin, Washington.

The paper describes resistance and self-propulsion tests on two series of three geometrically similar ship models; the first series represented the armored cruiser Washington (since re-named Seattle) and the second series represented the armored cruiser North Carolina (since re-named Charlotte). These were sister vessels of the same class, but by different builders. Results are also given of standardization trials over the same course for two vessels of that class.

In conclusion, referring to the agreement between predicted results from three models and observed results from ship trials, the author points out that while the discrepancies and variations are in some cases of appreciable amount the mean variations are small and are little, if any, greater than ought to be expected in the measured model trial results of sister vessels, even when observed and recorded by up-to-date methods.

He suggests that other experimenters might retest the same model with different dynamometers and different personnel and working up the results independently. Improvements are steadily if slowly being made in model basin instruments and methods and it is to be expected that this progress will continue. Development in this as in other lines is in proportion to the amount of time and thought that is expended on it.

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5 Welding Longitudinal Seams of Shell Plating, by Leon C. Bibber, visitor.

The author is senior welding engineer, bureau of construction and repair, navy department, Washington. This paper covers the experimental determination of the suitability of metal arc welding for the longitudinal seams of shell plating and other strength members of ships.

In his opening paragraphs the author calls attention to tests conducted abroad on welded seams pulled longitudinal and that these tests indicated that welded butt joints under these conditions fail at rather low value. It was on this account that the German navy did not use welding for the longitudinal seams of shell plating in their late cruiser design. For the same reasons, our own navy prohibited the use of welding on the longitudinal seams of the strength members of all important ships. However, no less than 19 auxiliary vessels up to 115 feet in length, constructed for the United States navy, have been completely welded.

The author points out that it is to find a solution of this problem in order to remove this restriction on the use of longitudinal welding for larger ships that the bureau undertook the series of tests described in this paper.

It is recognized that the conditions it was desired to investigate could not be simulated by small specimens. It is necessary to use plate thicknesses comparable to those of actual shell plate on larger ships, so that multiple arc welds could be used. The specimens were, therefore, designed to fail at about the maximum capacity of a large tension testing machine of the Unitae States bureau of standards. If greater capacity in testing had been available, larger and thicker specimens would have been used.

An interesting feature of the test was the broad-minded attitude of those in charge in inviting the presence of representatives of shipyards, navy yards and classification societies. The paper is a complete treatise on the test and brings out much valuable information. Many illustrations and diagrams are given.

Due to the increased interest in the use of welding for ship construction, all of the general conclusions of the author are given below:

1. That bare-electrode welding is not suitable for the longitudinal seams of shell plating and other strength members of ships in which the longitudinal stresses are of any great magnitude.

2. That lapped and strapped joints welded with bare electrodes, while they have a greater longitudinal efficiency than do butt joints, crack at relatively little beyond the yield point of the base metal, thereby impairing the watertight integrity of the ship.

3. That riveted joints of various types have a longitudinal efficiency of only about 90 per cent and an elongation of about 6 per cent.

4. That by the use of the proper types of joints and proper materials the junctions of seams and butts need not be considered, that is, no special method of plating need be adopted because of the use of welding.

5. That wide plates when under strain exhibit approximately the same tensile property as those of their coupons.

6. That the longitudinal efficiency and ductility of a plated structure are those of its joints and not those of the plates composing it.

7. That bare-electrode intermittent welding is suitable for the attachment of longitudinals to shell plating and other strength members of ships of appreciable size.

8. That bare-electrode chain intermittent welding is superior to staggered welding and that widely spaced intermittent welding (that is, with a low degree of continuity) is superior to closely spaced, although the superiority in both cases is not great.

9. That bare-electrode intermittent welding of increment lengths from 2 to 4 inches for average size welds seem to be most desirable.

10. That with an electrode giving deposits having an elongation in 2 inches of 20 per cent or more, and an ultimate tensile strength of 65,000 pounds per square inch, or more, suitable joints can be made having a longitudinal efficiency and elongation, and a tightness superior to any riveted or bare-electrode joints now in use.

11. That the shell of a large ship having lapped seams and butts (which are also very desirable practically) welded with such electrodes will be perfectly feasible at this stage of welding development; the main problem in such a project would be those of shrinkage, erection and cost, not strength.

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6 Education of Naval Constructors and Naval Architects, by Rear Admiral George H. Rock, (CC) U. S. N. (retired), vice president.

The author, since his retirement, Oct. 1, from the navy as chief constructor, has taken up his duties as president of the Webb Institute of Naval Architecture in New York. This paper is a useful review and analysis of the education of naval constructors and naval architects.

He has traced the beginnings of education along these lines bringing it up to date by giving the specific courses and time allotted to the subjects under instruction.

The first part of the paper is devoted to the training of United States naval constructors, from 1879, when the first American Naval academy graduate, cadet engineer, Francis T. Bowles, was sent abroad to take the course in naval architecture at the Royal Naval college, Greenwich, England. From that time until the first group of naval students entered the Massachusetts Institute of Technology in the fall of 1901, completing their three-year course in 1904, naval constructors were educated abroad at such institutions as the Royal Naval college, Greenwich; University of Glasgow, Ecole du Genie Maritime and the Technical College in Charlottenburg, Germany. He traces the development of the instruction for naval constructors at the Massachusetts Institue of Technology, under Prof. William Hovgaard, who had been selected to head the course at its inception, up to and including its present status.

Civilian courses in naval architecture and marine engineering is also described with particular reference to the three institutions now most prominent in presenting such courses, viz.: Massachusetts Institute of Technology, which has had such a course continually since its establishment in 1893; the University of Michigan since 1901, and the Webb Institute of Naval Architecture since 1894. Reference in some detail is also made to the education of naval architects and marine engineers abroad with the courses of instruction offered.

This study brings out marked differences in the methods of educating naval architects and marine engineers here and abroad, and that the practice of each country has its strong and weak points. He suggests that an exchange of students among the maritime countries might help to disseminate among the schools the best features of each and to eradicate undesirable practices. Also, that instead of attending school, exchange students might find it to their advantage to seek employment for a year or two in a foreign shipyard, experimental tank or shipping company. He believes that by so doing they would return as better rounded and more valuable engineers and the practice should improve the friendly relations of the countries involved.

In conclusion, he emphasizes that the education of our naval architects and marine engineers is of real concern to the shipbuilding and shipping interests in the country, and that their strength in the future will be measured by the judgment in technical proficiency of the young men who come to them from our engineering schools.

7 Stability of Ships After Damage, by J. C. Niedermair, member.

The author is attached to the bureau of construction and repair, navy department, Washington. It is pointed out in this paper that the interest in stability of ships has changed from an academic to a practical nature, and that since the requirements promulgated in the 1929 convention of safety of life at sea, the necessity is now imposed of making transverse damaged-stability studies before the degree of safety can be ascertained. In his paper, he proceeds to the consideration of the stability of the intact ship, pointing out that it is made up of three factors: Initial stability as a measure of resistance to heeling in small angles, form of a curve of righting levers, the amount of maximum righting lever and the angle at which it occurs, and the range of stability.

From consideration of the intact ship he goes on to a study of the damaged ship in its intermediate and final stage of flooding.

In conclusion, the author points out that extreme mathematical accuracy has little meaning in problems concerning flooding due to damage. And it is practically impossible to assess the permeability accurately, or to determine in advance the distribution and amount of the load and the extent of the actual damage. He, therefore, suggests that in practice it is possible only to obtain a relative degree of safety, ship for ship, when the requirements of the 1929 international convention or the conditions outlined in this paper, are applied to the design and operation of ships.

8 Raising the S. S. Sevogia, by Harold F. Norton, member.

The author is naval architect of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va. This paper represents a valuable contribution to practical knowledge in the effect of buoyancy and stability in damaged condition and also in the ingenious methods developed for overcoming a difficult situation.

The paper opens with a brief factual review of the catastrophe. Briefly the Segovia, a passenger and refrigerated freight ship, 447 feet long overall, by 60 feet beam, and about 7000 gross tons, fitted with accommodations for about 100 passengers, being built by the Newport News Shipbuilding & Dry Dock Co., for the United Mail Steamship Co., within a month and half of delivery, caught fire from an unknown cause and gradually turned over on her side toward the pier and sank.

The author then goes on to outline the problem of salvaging the ship, arrangements having been made for the shipyard to remove and dispose of the vessel. Much detailed information, accompanied by diagrams and photographs, is presented.

A careful plan was worked out beginning Jan. 11,1932, upon the receipt of a memorandum from W. Gatewood, works manager to the naval architect, plant engineer and hull superintendent, requesting them to collaborate in the preparation of a working scheme for raising the vessel. The plans submitted were approved by the management and preparations for the program of raising the vessel started on Feb. 1. The vessel was fully afloat on March 16 and on March 19, on an even keel, the Segovia entered dry dock.

With the exception of pile driving, dredging and certain divers' services, all work was planned and executed by the shipyard personnel.

It is a very interesting paper and both the plan and its execution reflect credit on the technical and practical staffs of the shipyard.

9 Structural Hazards on Shipboard, by S. D. McComb, member.

The author is president of S. D. McComb & Co., New York. This paper is definitely directed at those small but numerous details on modern vessels which constitute hazards to passengers and crew, but which being matters of detail rather than major features have been largely overlooked in such widely known conventions as that on the safety of life at sea, held in London in 1929, and the international load line convention held in London in 1930. These conventions, the author points out, give every traveler the assurance that vessels engaged in international trade will be staunch and fit to operate in the service for which they are intended.

Attention is called in this paper to some of those minor details which may cause accidents on board ship. Considering the safety of the passengers first, the author says, it appears that those engaged in designing and building vessels, themselves accustomed to being aboard vessels and going around them, do not always realize that there is a large percentage of passengers who are not accustomed to shipboard. He goes on to point out such things as stepping over sills and walking around on deck when the vessel is in a seaway. He believes that if more attention were paid to some small details, a vessel, which would cost no more to build, could be made safer for passengers and crew, reducing the number of personal injuries which are now costing ship owners heavy sums.

As the author is in the position to know fully concerning claims for injury, many of the points he makes in this interesting paper are bound to receive the serious consideration of owners, naval architects and shipbuilders. It is a useful paper in thus pointing out specifically the dangers inherent in certain arrangements which have come to be more or less

standard practice on shipboard due to what always seemed a practical necessity. The matter of high sills, for instance, in openings from deck to inside spaces is taken for granted as an obvious necessity. Perhaps some solution of this and similar details referred to can be worked out in a practical manner.

The author points out that all of the details mentioned in his paper are of a somewhat trivial nature, but it is the neglect of these trifles from which accidents occur and he believes that careful consideration of the items mentioned, as well as thought on the subject of safety, will be repaid by reduction in accident claims against shipowners. He gives the results of a careful record during the year 1931 of personal injuries on a group of 328 ships operated by American steamship companies. No less than 3307 reported injuries to passengers and members of the crew were filed for this group. In analyzing these injuries, 667 slipped or tripped, 466 fell, 614 were struck by objects, 627 were due to burns, scalds, etc., and the remainder were from various other causes.

10 Resistance of Flat Surfaces Moving Through a Fluid, by Karl E. Schoenherr, member.

The author is attached to the United States experimental model basin, Washington. This paper deals with frictional resistance in its relation to the resistance of ships. He points out that the resistance of surface ships depends on the speed, the form of the ship and on the nature and extent of its wetted surface. For low speed ships the resistance is about 85 per cent frictional, the remainder being wave and form resistance. For high speed ships, frictional and residuary resistance is about equal. Before dealing with frictional resistance in detail, the author discusses briefly the general theory and practice of ship resistance determination. This paper represents an exceptionally thorough research into the fundamental literature on resistance.

Experiments with 3-foot and 6-foot friction planes at the United States model basin are described and analyzed. Consideration is given to the influence of temperature variation on the resistance of plane surfaces. The results of experiments with a 6-foot catamaran plane are given. The completed results of tests with plane surfaces are analyzed in detail and a mathematical exposition is given.

Finally, the author extends his discussion of the frictional resistance of smooth, flat surfaces to the frictional resistance of uneven and curved surfaces of ships' hulls and points out that in doing so it is seemingly necessary to leave the firm foundation of experiment to enter the realm of speculation. He points out, however, that this is not quite the case as many notable attempts have been made by Froud, Baker, Kempf, and also at the United States experimental model basin, to determine the influence of various degrees of roughness and the effect of projections such as butt straps and laps on shell plating of a ship. Also, within another direction, attempts have been made to introduce a parameter for the effect of curvature of a ship's surface.

Beginning with the total water resistance of a given ship, the author proceeds to develop the frictional resistance and to evaluate the roughness allowance which amounted to 33 per cent.

It is work of the kind the author presents in this paper which leads slowly but surely to a clearer conception and a firmer grasp of the underlying facts of resistance, thus increasing the practical value of the application of theory and experiment to the solution of design problems.

11 Elastic Characteristics of a Naval Tank Vessel, by Lieut. Wendell P. Roop, (CC) U. S. N., visitor.

The author is attached to the United States Experimental model basin, Washington.

In this paper is presented the experimental determination of three quantities in connection with ship design which are ordinarily subject to calculation only. These quantities are: Sectional modulus, effective modulus of elasticity of assembled structure, and loads occurring in service.

It is pointed out that high precision was not attained but even approximate data in this field are believed to be of value. The determination of these quantities occurred in connection with a study of vibration of fleet oilers of the United States navy. The vessel dealt with was the Cuyama, 455 feet long, 56 feet beam, transversely framed on 27-inch spacing. This vessel was subjected to static bending loads in still water, with observation of deflections on the ship as a whole, and of elastic extension in the weather deck. Autographic records of elastic extension at the same stations were then obtained at sea, leading to data on bending loads.

The author gives details of the tests and the manner in which they were conducted. Photographs reproduced in this paper show the nature of buckling effects. The author states that no very definite conclusions can be drawn from these observations, but it seems impossible to reconcile the facts with the usual point of view according to which a hatch is a soft spot. Plating adjoining a hatch forward and aft is far from refusing load entirely. He also asks how plating between hatches can be buckled when that in the adjoining centerline strake is not unless the hatches are effectively hard spots. If these hatches are really hard spots, he suggests, we should be able to take advantage of this situation by providing enough local stiffening to stop buckling and make the plating between hatches stand up to its load. A reduction in scantlings elsewhere might also become possible.

12 Propulsion Turbines and Gears for Panama Mail Steamships, by A. R. Smith, visitor.

The author is managing engineer, turbine department, General Electric Co., Schenectady, N. Y. This paper, as the title indicates, is a description, with illustrations, of the geared turbine machinery built by the General Electric Co., installed in the SANTA ROSA and three sister ships building for the Panama Mail Steamship Co. by the Federal Shipbuilding & Dry Dock Co.

It is pointed out that economy in the consumption of fuel is dependent on the increase in steam pressures and that marine engineers are gradually coming to higher pressures because of the satisfactory experience of stationary steam plants with 600 pounds steam pressure over a period of ten years and with 1200 pounds steam pressure during the past six years. The propulsion equipment under consideration in this paper is built for 400 pounds per square inch pressure representing modern marine practice and a step in the direction of stationary practice in the use of high pressures. The turbine temperature is 725 degrees Fahr. which has been quite common in stationary plants for several years. A temperature of 825 degrees Fahr. is now being introduced in stationary practice while temperatures of 900 to 1000 degrees Fahr. are being seriously considered.

It is pointed out that one of the principal reasons why the marine engineer has not introduced higher steam pressures is probably because there are essentially no spare units in the ship as are found in the stationary plant, and the salting of the condensate represents a greater hazard with higher steam pressures. However, more reliable condenser-tube materials are now available, and with higher steam pressures and more extraction, the condensing surface is sufficiently reduced to permit the use of more expensive materials, or other means of preventing the salting of the condenser.

Some of the particulars of the Santa Rose and sister ships are given in the paper.

13 Performance of the Mariposa and Monterey, by J. E. Burkhardt, member of council.

The author is chief engineer of the Bethlehem Shipbuilding Corp., Quincy, Mass. A full abstract of this paper appears elsewhere in this issue.

14 Performance of Standard Oil Tankers, by R. L. Hague, member.

The author is vice president and general manager of the Standard Shipping Co., New York, and considering the great fleet of this company, few people in the world are in a better position to speak with authority on the performance of tankers. This paper, therefore, represents a most valuable contribution to the knowledge and actual performance of this class of vessel. The paper begins by summarizing the fleet of this company as follows:

At the end of 1931 the fleet of the Standard Shipping Co. consisted of 45 tankers aggregating 613,114 deadweight tons. In addition, the Standard Shipping Co. acts in an advisory capacity to the affiliated foreign companies having a total of 100 tankers of 935,310 tons deadweight capacity, 47 vessels of which are motorships with a combined deadweight capacity of 581,056 tons. As a result of the above operation, coupled with the availability of records on those ships not owned, the Standard Shipping Co. has been in a position to study the service performance of 145 ocean-going tankers having a deadweight capacity which totals 1,548,424 tons, as of Dec. 31, 1931.

Constant competent supervision is necessary to obtain maximum savings in the cost of repairs, stores, provisions, fuel and port charges, and to reduce to a minimum unremunerative delays in port. Of the items making up operating cost, fuel presents normally a problem of greatest importance, and this paper deals specifically with the problems of fuel consumption and engineering performance which have come to the attention of Standard Shipping Co.

It is interesting to note that a group of oil tankers covered by this paper, there are included the following types of machinery:

1. Triple and quadruple-expansion reciprocating engines with Scotch boilers.
2. Reciprocating engines with exhaust steam turbine and Scotch boilers.
3. High pressure, double reduction geared turbines with watertube boilers.
4. Two and four-cycle diesel engines, single and double acting.
5. Two-cycle opposed piston diesel engines.

The company's barge equipment includes one tanker having diesel electric drive. Under construction at this time are nine 7800-ton tankers having two-cycle double acting and single acting diesel engines of the airless injection type.

Much valuable detailed information on performance of vessels fitted with different types of power is given in this paper, and the author's conclusions are given as follows:

We wish to draw the following conclusions, which are the result of our experience with the various types of machinery in respect to the trade in which the vessels operate:

1. That the diesel is most suitable to our needs in the foreign trade involving long voyages in practically every case.

Reasons:

(a) Release of deadweight capacity of cargo on a long haul.

(b) Bunkering at loading ports for round trip, with result in saving on a high differential and fuel cost.

(c) Lower repair costs abroad as a result of the availability of more experienced personnel, lessening time in port for repairs.

2. That the steam turbine, operating under high pressure and temperatures, is more suitable for coastwise trade.

Reasons:

(a) Lower repair costs and quick turn around as a result of the small number of repairs.

(b) Relatively low differential between domestic bunker C and diesel fuels, as well as the comparatively small spread between the cost of fuel at the loading port and the discharging port.

(c) Smaller capital investment than diesel.

(d) More economical in fuel consumption for all purposes than other types of steam units.

It is our feeling, however, that changes in the types of fuel in the future may render the above conclusions obsolete; but for the present time these have proved to be the case in actual service.

15 Modern Power Plant Practice and Its Application to Marine Work, by R. C. Roe, visitor.

The author is design engineer, Electric Management and Engineering Corp., New York. The conclusion drawn from this paper by the author are:

This paper, prepared by a stationary power plant designing engineer, who admittedly knows little of the marine industry, is written not with the thought that stationary power plant apparatus in itself, is suitable for marine use, but rather with the thought that the principles involved are similar, although the requirements are somewhat different and that by pointing out the progress that has been made and is being made in stationary plants some small degree of help may be given to the marine industry.

The writer well recognizes the difference between the two industries and is not trying to inflict on the marine industry any of the improvements utilized in the stationary power plant, but, in the same manner as the stationary power plants have benefited in the past, and are benefiting now from the advances in the marine art, there is no reason why the marine art cannot benefit from advances in the stationary art.

With the cost competition where it is today, the lessons of better economy from higher pressures and higher temperatures, the lessons taught by better heat cycles, those taught by better control of combustion and closer supervision of apparatus all should be beneficial to the marine industry.

The question often arises: "How can higher pressure, higher temperature equipment be installed without excessive first cost?" The answer as it has been worked out in stationary plants, is the same answer that would seem to be applicable to marine plants, that is, use less equipment, build it better, make it more reliable, but, by the mere decrease in quantity keep the cost within bound. This is particularly true in the boiler room.

The point will immediately arise in the marine engineer's mind, "If I have fewer boilers and work them harder, what is going to happen if I get a condenser leak?" The answer to that problem is, of course, build condensers better, keep closer control over them, use divided water boxes, if necessary, so that the condenser leaks can be repaired without taking the condenser out of service. The operation of the evaporators must also be given greater care, to the end that pure water is always obtained from this service.

16 Machinery for Modern Cargo Ships, by J. H. King, member of council.

The author is manager, marine department, the Babcock & Wilcox Co., New York. In this paper he calls attention to the need of modern machinery for cargo ships, in part as follows:

A large proportion of the cargo tonnage under the American flag was built prior to or during the World war period and only 2.2 per cent has been built during the last ten years. In view of the rapid progress and increased power in propulsion machinery, it can safely be said that today about 98 per cent of the cargo tonnage is obsolete compared to the competitive value of ships fitted with the economical machinery now available.

It, therefore, seems appropriate to consider present day requirements of cargo tonnage of various types, desirable speeds, the effect of increased speed on the propulsion equipment and the type of machinery now available.

The author discusses specifically the effect of increased speed; type of machinery; factors affecting selection of machinery; choice of fuel;

cost of fuel oils; cost of machinery; modern steam machinery; boilers and furnaces; superheaters; turbines; other features of the propelling plant; maintenance and reliability; and performance data.

Specific performance data for the tanker S. S. VIRGINIA SINCLAIR are given for the six months ending June 30, 1932. On the basis of six months' operation the cost of lubricating oil per year for this tanker is $126.57, the cost of engine department crew per year $16,380.; and the cost of the entire ship's crew for year, $41,280. The cost of the fuel oil consumed per day loaded during the six months' period was found to be $108.57. For the performance of the S. S. VIRGINIA SINCLAIR on two long voyages the cost of the fuel oil consumption per day is given as $100.79. Performance data is also given for the carferries CITY OF SAGINAW and CITY OF FLINT, having twin screw turbine electric machinery. Pounds of coal consumed per mile for the CITY OF SAGINAW is 379; and for the CITY OF FLINT, 403.

In conclusion the author states:

The present condition of our uneconomical cargo tonnage warrants careful investigation of the value of faster modern ships equipped with economical machinery. Hull design and other features of the ship, as well as the machinery, affect its economy. However, since fuel cost and the propulsion equipment generally are such important items in the cost of a ship, the type of machinery installed is one of the principal factors to be considered.

In selecting machinery, careful consideration must be given to all factors involved. Only a careful accurate analysis of all the facts on a truly comparable basis can determine the type of machinery to install in a ship for any particular trade.

The advances that have been made in the steam machinery that is available today provide propulsion equipment that is highly economical and thoroughly reliable. The predominance of modern steam machinery in this country is due to sound engineering and a careful analysis of all facts.

The type of machinery to install in any ship is the one that will have the lowest net cost and will bring the greatest return on the investment. It is believed that present steam machinery fulfills these requirements for modern cargo ships in a great many cases and that future developments will further strengthen the value of steam propulsion equipment.

Membership of Society Increased

TOTAL membership in the society during the past year has been increased to 1596 as of Oct. 31, 1932, compared with 1541 on Oct. 31, 1931. Thirty-five new members, twelve associates and eight juniors were elected to the society at this meeting.

J. Howland Gardner who was elected in 1930 as president of the society for a term of three years, continues in this office. Other officers and council members were elected at the fortieth general meeting as follows:

Officers and Council Members

Honorary vice presidents: R. H. M. Robinson and J. H. Mull.

Vice presidents for the term ending Dec. 31, 1935, D. H. Cox, M. D. Ferris, Rear Admiral E. S. Land, and Rear Admiral S. M. Robinson; for the term ending Dec. 31, 1934, H. H. Brown. Council member, representing members J. L. Luckenbach, Commander H. E. Saunders, James Swan and H. Gerrish Smith; representing associates, John D. Reilly. Membership of the executive committee is as follows: Rear Admiral W. L. Capps, H. L. Ferguson, J. W. Powell, M. D. Ferris, H. P. Frear, H. H Brown, and Rear Admiral G. H. Rock. Secretary-treasurer is H. Gerrish Smith, and the assistant secretary-treasurer is Thomas J. Kain.

By ballot of the members the following were elected council members, term ending Dec. 31, 1935: Capt. William McEntee, Carl E. Petersen, J. H. King, Capt. John K. Robison, David Arnott, and Clinton L. Bardo; and associate council members, term ending Dec. 31, 1935, Herbert L. Aldrich, Clifford D. Mallory and Robert F. Hand.

Keeping to long established custom, the annual banquet of the society was held at the Waldorf-Astoria on the evening of Friday, Nov. 18. The president, J. Howland Gardner, presided as toast master. The principal speakers were Rear Admiral G. H. Rock, U. S. N. (retired), former chief constructor United States Navy, and Clinton L. Bardo, president of the New York Shipbuilding Co.

In his interesting address, Mr. Bardo emphasized the relation of shipping and shipbuilding to the industrial rehabilitation program of interest to all groups and sections of the United States. He said in the concluding part of his speech: "Many Americans are seemingly indifferent to the extension of protection to our ships in overseas trade. They fail to realize that mail contracts are not intended solely as a means for payment for the carriage of the mails, but are frankly intended to make possible and assure the maintenance and continuance of different services under the American flag in the interest of our foreign trade and the expansion of our overseas markets.

"I believe you men who design and build ships today and all their equipment are doing a better job in that field than in trying to educate the American public and maintain that in our thought of making the ship itself, we have made it so perfect, we have made so much of it, that we have neglected making America shipminded. I submit to you that unless we turn to a consideration of this human element we are going to be unable to pull out of the place in which we find ourselves today. You say you have many engineering tasks still before you and I admit that that is true. But I believe the greatest task and the most important is the education of the public to the end that the reflective sentiment of all the country will sense the great necessity, compel the legislation and produce the patronage required to turn America to the way of triumph on the seas."

Admiral Rock in his address brought out clearly the neglect of the United States in keeping its navy up to the strength intended when the London naval treaty was negotiated. The other nations have not been nearly as backward in this respect. As the Admiral points out, additional programs necessary to build up to treaty strength by Dec. 31, 1936, call for 119 vessels for the United States, 66 for the British Empire and only 7 for Japan. These figures, the Admiral pointed out, give a clear idea of the condition of our navy. The situation is perfectly clear. Are we content to drop back in our position of a sea power? Obviously the other first class powers are not.

He also stressed the importance of adopting the convention of safety of life at sea in order to join with the rest of the world in advancing the standards of safety in design, construction and operation of not only our own ships but also those of other countries in which so many Americans travel.

Convert to Cabin Ships

Officials of the Grace Line have announced that the four ships at present in service between New York and California, the SANTA CECILIA, SANTA ELISA, SANTA TERESA and SANTA ANA, will be converted into cabin or one-class ships with a minimum fare between New York and California of $135.

The new classification and lower rate will go into effect in New York with the sailing of the SANTA ELISA from Pier 95 North River, Dec. 1, and will start on the West coast with the sailing of the same ship from San Francisco Dec. 26.

These four cabin class Grace liners will continue their fortnightly voyages via Panama canal, to and from New York and California.

The conversion of these four popular Grace liners into the cabin class and the addition of four new $5,000,000 ships to the Grace line's service between the eastern and western seaboards, it is expected, will give added impetus to the ever increasing popularity of Central America both as travel resorts and trade centers.

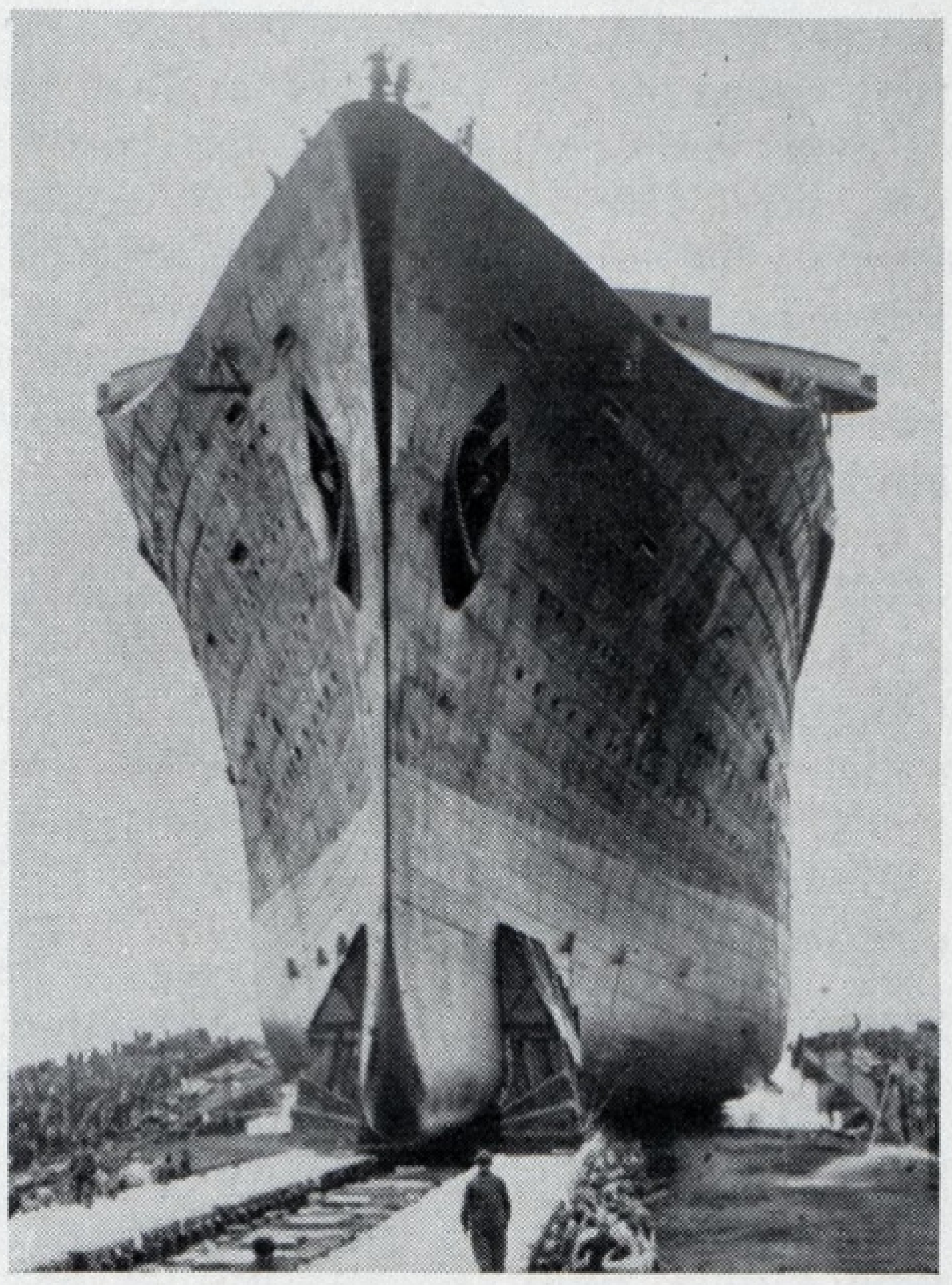
Launch French Superliner Normandie

World's Largest Vessel—Ready in 1934

JUSTLY proud of a great achievement, the French nation acclaimed the launching of the NORMANDIE, the world's largest liner, at St. Nazaire on October 29. The launching was attended by many notables in commercial, financial, naval and political affairs headed by President Lebrun and Madame Lebrun, wife of the President who christened the giant liner. The NORMANDIE will enter the New York-Havre service of the French Line in 1934. It is anticipated that she may make the crossing in less than five days. The total cost when completed will be $30,000,000. President Lebrun made the principal address emphasizing the significance of this liner in the improvement of means of communication and in reducing the distance between nations, thus aiding the cause of universal good will.

One of the accompanying illustration, an artist's drawing of the new vessel, indicates that her appearance will be quite different from present liners. A modified clipper bow, cruiser stern, three large low widely spaced funnels and closed-in forward deck, all tend to give her a rakish and speedy appearance. What the speed will be is not known at this time but the 160,000 horsepower at normal rating delivered to four propellers will enable this ship, in any weather conditions, to make the voyage from Havre to New York, via Plymouth, in under five days. This permits of a voyage in each direction once a fortnight whereas the speeds of earlier ships is only sufficient for such voyages every three weeks.

In other words, a weekly service, which now requires the running of three boats, would be possible with two ships of the NORMANDIE type. This voyage schedule is, moreover, exactly that which the Cunard line aims at with its two steamers of similar type now partly constructed or under design.



Normandie Launched at St. Nazaire

General Particulars

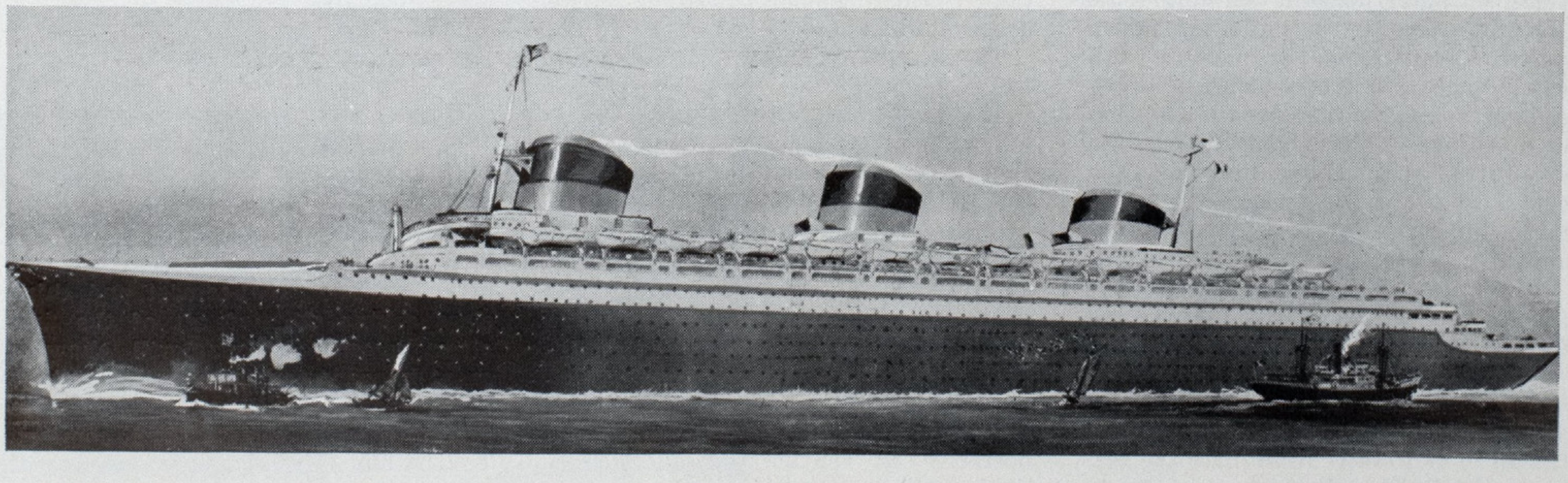
Builder	Penhoet Shipyards, St. Nazaire
Launched	Oct. 29, 1932
Length overall, feet, inches	1027 0
Length between pp., feet, inches	963 0
Beam at Main Deck, feet, inches	117 9
Beam at Prom. Deck, feet, inches	119 6
Depth molded, Prom. Deck, feet, inches	91 4
Height, keel to top of Chart Room, ft., in.	128 0
Draft loaded, feet, inches	36 7
Displacement, loaded, tons	67,500
Deadweight, tons	12,000
Bunker capacity, cubic feet	338,980
Cargo capacity, cubic feet	123,295
Water ballast capacity, cubic feet	258,356
Gross register, tons (approx.)	75,000
Propelling machinery, turbine electric, four turbine driven a.c. generators, four electric motors, total shaft horsepower, normal	160,000
Boilers, oil burning, watertube	20
Working pressure, lbs. per sq. in.	400
Steam temperature, degrees Fahr.	662
Passenger capacity, in four classes	2,132
First class	849
Second class	258
Third class	540
Tourist class	485
Crew, total number	1,320
Service, express run	Havre and New York
Speed, crossing	Less than 5 days

For convenience the principal general particulars of the ship are given separately in the accompanying table. So vast and elaborate is this ship that only a few of the high points of her design can be touched upon in this article. The hull is divided transversely by eleven watertight bulkheads and longitudinally by bulkheads parallel to her sides, thus with the inner bottom forming a double shell throughout the entire portion of the ship occupied by the engine and boiler rooms, etc. The hull is again divided by eleven decks of which five are continuous. The inner bottom or ballast tanks extend over the entire length of the ship and are subdivided into forty-two compartments by water and oiltight bulkheads. Twenty tanks are used for boiler feed water, 4 for sea water and 18 for heavy oil fuel. The double shell referred to is subdivided by cross bulkheads into 54 compartments, of which 30 are for heavy oil fuel, 22 for boiler water and 2 permanently empty. Four great tanks are located aft, for drinking water.

Forward on the sun deck are located the commander's quarters, the wireless room, chart room, instrument room, sheltered navigating bridge and the bridge itself. Engineer officer's quarters are located aft on this deck.

Use of High Tensile Steel

It is interesting to note that the hull itself, weighing about 30,000 tons, has required many exceptionally large and heavy forgings. The total weight of the stern piece is in excess of 100 tons and it is made in two pieces, the larger weighing 74 tons. Each of the four tail shaft frames weigh 50 tons. Together the rudder post and rudder



Artist's Drawing of Giant French Liner Normandie Launched at St. Nazaire, Oct. 29—Quadruple Screw—Turbine Electric

weigh 125 tons. To lessen the enormous weight, high tensile steel has been used on a large scale and the same strength has been obtained with less thickness than would normally have been used. This same special steel, which has a breaking strain of 40 tons per square inch, as against 30 tons of ordinary ship steel, has been used at the vital parts of the hull which take the longitudinal stresses of the ship, that is, in the outer plating of the double bottom and in the upper decks. About 5000 tons of high tensile steel have been thus used in the construction of this ship.

Though electric welding has been extensively used in the construction of the hull, no less than 11,000,000 rivets have been driven. These rivets placed end to end would reach 406 miles.

No less than 56 lifeboats are served by 30 pairs of Welin-MacLachlan gravity type davits. No manual effort is required in launching the lifeboats. They can be lowered by the simple working of a lever. Two of these lifeboats are powerful motorboats with a speed of 10 knots and each fitted with long distance wireless. In case of need they will tow the other lifeboats. In addition to this complete lifeboat equipment, the ship will be fitted with all the latest approved types of apparatus for safety in navigation, both at sea and for docking and undocking.

In particular, there is a gyroscopic compass fitted with a route and rudder angle indicator. This indicator controls a number of repeater stations in various parts of the ship, so that the course of the ship can be seen instantly by any one concerned. The gyro compass automatically controls the servo-motor working the rudder, thus, with the use of a gyro pilot compass, the ship follows automatically any route that is set without the intervention of a helmsman. The exact position of the rudder is also indicated at various points on the bridge and in the engine room.

Safeguards to Navigation

A sounding apparatus using wireless ultra-sonorous rays of Langevin—Chilowski—Marty type shows instantly and with absolute precision the depth of water beneath the ship. This apparatus records the soundings which may be continuous throughout the whole route. There is also a standby electric sounding machine in addition to machines of the ordinary type. An apparatus with indicators on the bridge show at a glance, at any moment, the exact draft of the ship, fore and aft.

A wireless directional finder gives the exact position of the ship when desired by taking cross bearings from wireless stations ashore. Two powerful searchlights, one fitted at each end of the bridge, serve among other things to brilliantly illuminate the sea, to facilitate operations in case boats have to be launched or for any other emergency.

No effort has been spared to provide modern, efficient and dependable propulsion equipment. For the first time, a French ship of great tonnage will be fitted with electric propulsion. Four steam turbines will drive four alternating current generators, similar to those used ashore in the great electric power plants. The three phase current delivered by these generators is of 5000 volts and supplies the power for four electric motors placed in the stern of the ship and which are coupled direct to the four propeller shafts, having a total normal rating of 160,000 horsepower; the largest motors ever built for any purpose.

The turbines, generators, and motors were designed and constructed by the Alsthom Co., French associate of the General Electric Co. of United States which is acting as consultant in the work. The Alsthom Co. also designed and constructed the propellers and the electric steering apparatus.

Twenty Watertube Boilers Installed

Steam is supplied to the turbines by twenty watertube boilers with a working pressure of 400 pounds per square inch and a total temperature of 662 degrees Fahr. Boilers of this type were fitted by way of trial on the CHAMPLAIN, also built by the Chantiers de Penhoet, and they have been found to give entirely satisfactory results.

For the ship's auxiliary machinery, lighting, ventilating, cooling and other purposes, there are six turbine generators delivering direct current at 220 volts with a capacity of 60,000 amperes.

The speed aimed at in the NORMANDIE though not officially designated is in the region of 30 knots. To get this result it has been necessary on the one hand to design engines of the greatest possible power and reliability, and on the other, to design a ship the lines of which will make possible maximum speed with minimum power and consequently relatively low fuel consumption. These factors having been met also insure good seagoing qualities and the ability to keeping schedules despite heavy weather. In studying the lines of the hull, more than 60 models were used in the experimental model tank. These models were of many different lines and drafts.

The shape of the hull finally adopted has a bulbous stem, less pronounced than the German and Italian vessels, but particularly adapted to the size of the NORMANDIE. The great height of the ship's bows and forecastle deck and the pronounced flare of the sides will make it possible for only very exceptional waves to reach the upper decks. In addition what is usually the forecastle deck, is in this case reminiscent of the covered in bows of a submarine, for it is completely closed in by rounded sheathing and clear of such obstacles as ventilators and fittings likely to be smashed in by the sea. Any waves falling on the bows will be deflected back to the sea and so damage to the ship will be avoided without loss of speed.

In interior arrangements and decorations, no effort has been spared to provide a maximum of comfort for all four classes. Decoration of the ship will stand as a monument to French art. A committee of leading architects in collaboration have worked out the arrangement and finish of the special saloons in the first class.

Fine Spacious Public Rooms

A lofty grand hall, the full height of the ship and situated slightly forward of amidships form the center of all public spaces. The promenade deck is almost entirely devoted to the large public rooms included in which are, forward, a winter garden, reading room, and childern's playroom, and aft a special theater hall. Aft of the central hall is the grand salon with smaller drawing rooms adjoining, then a smoking room in two stories, the upper one on the sun deck. Further aft, as an extension of the smoking room, on the sun deck there is a glass sheltered cafe, looking out astern on a special dance floor. Beyond the cafe is a roof garden which will embody several features never before seen on a ship.

The promenade itself will be treated in a novel way in flooring, decoration and especially in lighting. Above the promenade deck are several sports decks, all entirely free from ventilator cowls, ventilating machinery, pipes, winches, etc., permitting games without obstructions and giving an uninterrupted view over the ocean in every direction. Special smoke baffles have been fitted in the funnels designed to prevent soot falling on the decks.

Ventilation has been carefully studied and there will be no ship odors in passenger quarters or smells from the kitchen, engine rooms, etc. On other decks of the ship, public rooms include main dining room, with smaller dining rooms adjoining the whole of a size never before attempted in any other ship. The dining room will be ventilated with purified air in such a way that an even temperature will always be maintained.

Forward of the grand hall, there will be a chapel and, deeper down, a swimming pool with bar gymnasium, etc. The decorations here will embody several new stlyes.

Improved Lesser Class Quarters

Though the first class cabins will provide for everything desirable in the way of luxury and comfort, the utmost comfort, the utmost precautions have been taken against the danger of fire. Public rooms, tourist and third class cabins situated aft of the first class accommodations, will show a great improvement over existing ships in spaciousness, lighting, ventilation and generally in taste and comfort. Tourist and third class passengers will have access to great open and covered

decks descending in terraces from the upper sun deck down to the stern.

Ten lifts will serve passengers and two will connect engineer officer's quarter's on the top deck with the lowest compartments in the ship. Kitchens will be all electric and will embody the latest improvements in culinary equipment.

Wireless on the NORMANDIE will be most up-to-date and complete and two wireless telephone installations will be provided for passengers which will enable them to telephone to Europe and America in the same manner as a telephone subscriber ashore. In addition there will be an ordinary wireless telegraph service as well as two installations for ship's use, one on short wave, and the other on long wave, both of which will enable the ship to remain in direct communication with Europe and America throughout the voyage.

Since the NORMANDIE is the biggest ship ever to take the water preparations for launching necessitaed careful calculations. Never before have 30,000 tons of steel been launched, to say nothing of an additional 1215 tons, the weight of the cradle and launching gear; a total moving mass of practically 32,000 tons. This tremendous bulk glided into the water on oak blocks, the lubricant being a layer of tallow and soap. The oak blocks had a total measurement of 6354 cubic feet and the total amount of wood used in the launching measured 7766 cubic feet. 43 tons of tallow, 2½ tons of lard, and 22 hundredweights of soap were used as greasing material, costing approximately $5000.

The enormous weight referred to had to start down the slip from a standstill, take the water and be brought to a standstill again after sliding 425 yards, a stupendous mass to bring up in such a short distance. To act as a brake, bundles of great chains, weighing 100 tons, were dropped on both sides of the ship. According to calculations, at no moment during the launching did the speed exceed 17 feet per second which is just a trifle over 10 knots.

Care had to be taken to see that the weight of the ship and her cradle was spread evenly over the whole of the greased slip, in such a way that at no spot did the weight exceed 28 to 30 pounds per square inch, otherwise the layer of tallow would be forced out and and the ship would not slide properly.

The most delicate moment of the operation is when the ship enters the water and starts to float, and the cradle commences to leave the ship. One end of the cradle then begins to float and the tremendous weight of the fore part of the ship rests upon a relatively small part of the cradle, still resting on the slip. The force exerted on this relatively small portion of the cradle amounts to something like 8000 tons. The impetus which the ship gathers forces its stern into the water to a depth of 49 feet, in this case leaving a mere 4 feet between the hull and the bed of the sea. The actual launch required about 600 men.

Rex Makes New Record

The REX of the Italian line arrived in New York on her second westward passage on Nov. 8, from Genoa, Nice and Gibraltar, with 822 passengers. On this voyage the new Italian line flagship established a record on the direct route from Italy to New York.

She left Genoa on Nov. 1 at noon, stopping at Nice and Gibraltar and was reported passing Ambrose light at 4 a. m. on Nov. 8. Allowing for the time taken in coming to anchor and stopping at Nice and Gibraltar, the total time of the passage is estimated at approximately 6½ days.

Converted Ships Maintain Strict Schedules

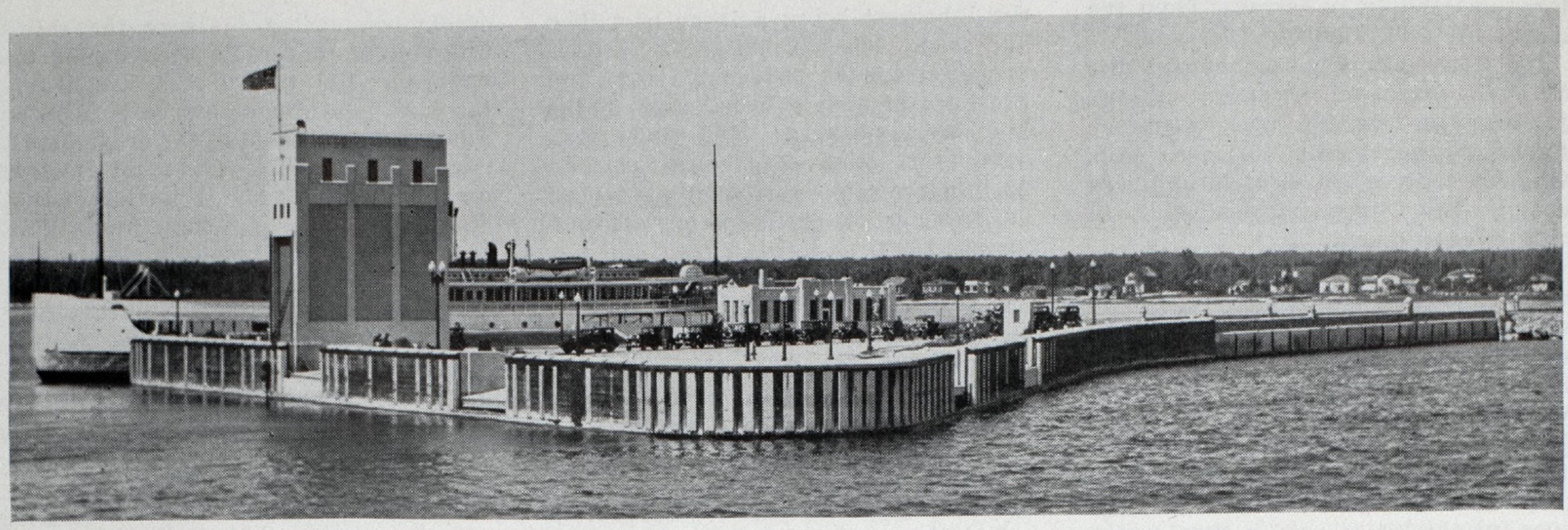
ONE of the most important and elaborate of the conversions of existing vessels is that of the five ships for the Baltimore Mail Steamship Co. This line began operation with the first of these ships July 2, 1931. The remaining four ships were placed in service at about monthly intervals after that date. Therefore, all of these ships have now been in service about a year or over. A complete illustrated description of these vessels appeared in MARINE REVIEW for April, 1932.

The work of conversion was done by the Federal Shipbuilding & Dry Dock Co. from designs by the New York naval architects, Gibbs & Cox Inc. Entirely new propelling machinery, of 9500 shaft horsepower, De Laval compound double geared turbines, developing the designed power at 95 revolutions per minute of the propeller, was installed. The names of the vessels are CITY OF BALTIMORE, CITY OF NORFOLK, CITY OF HAMBURG, CITY OF HAVRE and CITY OF NEWPORT NEWS. Weekly sailings are made between Baltimore, Norfolk, Havre, Hamburg and Bremen.

Terminal of the Baltimore Mail Steamship Co. at Baltimore—City of Hamburg at dock while the City of Newport News is just about to come alongside. The satisfactory performance of these ships in service has demonstrated the value of well planned and thoroughgoing renovation

From eleven knot freight ships originally, the improvements in hull design and increased power of propelling machinery, with accommodations provided for about one hundred passengers, have placed these vessels in a distinct class in the North Atlantic passenger-cargo trade. Some eastward voyages have been made at an average speed of 17 knots and the average speed of four of the ships on a total of thirteen eastward voyages was over 16.8 knots. Their passenger accommodations during the height of the season were in such demand that it was found necessary to increase the passenger capacity from the original 81 to approximately 100.

Joseph Cook, superintending engineer of the fleet, reports that there has been a minimum of upkeep expense and that there has been no delay or change in sailing schedules due to machinery mishap or failures. He has also reported that upon opening up the machinery for inspection, everything has been found in first class condition, all parts operating satisfactorily and efficiently.



Modern terminal at Mackinaw City—State of Michigan's Ferry Service across Mackinac Straits

STRAITS OF MACKINAC

A State Owned and Operated Ferry Service

By Frank F. Rogers

FOR many years prior to 1923 crossing the Straits of Mackinac with motor vehicles was not only difficult but costly. The necessity for better and cheaper automobile ferry service across the straits than was rendered by the railroad carferry was strongly impressed upon the minds and pockets of travelers; and then public interest was aroused.

That this service was costly should not be taken as a criticism of the carferry management for the Mackinac Transportation Co. has never had a very profitable business and the hazard of carrying passenger automobiles over its switching tracks and on the same boat with railway cars was so great that this company was not particularly eager for the automobile business. However, of late years the company has fitted its vessels and approaches for carrying automobiles during the winter months when the state ferries are not running, and now seem to appreciate the business. The residents of the Upper peninsula had long been advocates of a strictly automobile ferry managed, either by a private company or by the state and by the winter of 1923, this demand was translated into a bill presented to the legislature by Senator Bohn creating a state ferry service across the straits, as a part of the Michigan highway system. This bill became a law and in part reads as follows:

"It shall be the duty of the highway commissioner to operate a ferry line as a part of the highway system of the state across the Straits of Mackinac for the purpose of transporting vehicles, freight and passengers between the Upper and Lower peninsulas.

"Suitable boats, docks or landings, shall be secured through purchase, lease, condemnation or agreement, so as to adequately accommodate highway traffic across such straits.

"The charges and tolls for such service shall be fixed by the commissioner on the basis of cost including interest on investment and proper allowance for depreciation."

Terminal Site Acquired

The act was given immediate effect and no time was lost in establishing the service. The Chambers dock at St. Ignace was purchased and docking space on the north face of the Michigan Central Railway dock at Mackinaw City was rented. The Mackinac Transportation Co. load the cars in a slip at the end of the dock and this operation did not interfere with the state ferry except that it was necessary for all cars to pass over the loading railway tracks in order to reach the state boat.

At St. Ignace the Chambers dock was an old wooden structure, somewhat delapidated but capable of holding 1500 tons of coal besides affording ample space for loading and discharging automobiles. It had 216 feet of frontage on the straits and the porperty included 145 feet of frontage on State street, which is the main business street of the town.

There was no available dock for sale at Mackinaw City, so the state purchased a new dock site with 115 feet of frontage on the lake, about

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The author, Frank F. Rogers, C. E., is Consulting Engineer, Michigan State Highway Department.

St. Ignace Terminal—Mackinac Straits State Ferry—Opened Oct. 31

500 feet south of the Michigan Central Railway dock. On this site a stone causeway was built, with a 20-foot concrete roadway and a 5-foot sidewalk on one side, extending some 1400 feet into the lake. At the end of the causeway, a landing pier 24 feet wide and 220 feet long, was built in 14 feet of water. The pier consisted of stone filled wooden crigs up to the water line on which were built concrete sidewalls filled with gravel, over all of which a heavy concrete capping was placed with suitable ramps to fit the gangways of the boats.

In 1923 the state purchased the steamer ARIEL which was a small wooden ferryboat, plying between Detroit and Walkerville, Ont. The ARIEL accommodated 20 automobiles and while well adapted to river service her low overhanging deck was not well suited to service on the straits where occasional rough weather made it necessary to tie her up for a day at a time. The purchase price was $10,000 but an additional $9000 was spent for bulkheads and other improvements required by the steamboat inspectors.

Two Vessels Are Purchased

In the fall of 1923 the state purchased two boats built by the federal government during the war. These boats cost the government about $300,000 each, but were sold to the state for $15,000 each. They were formerly known as the COLONEL CARD and COLONEL POND but were re-christened by the state as the SAINTE IGNACE and MACKINAW CITY.

These boats had to be brought from the Atlantic seaboard and being only 130 feet in length and 28 feet in beam, were too small for automobile ferry service and were therefore lengthened to 180 feet each, thereby giving a capacity of about 40 automobiles for each boat. This work was done at Detroit by the Great Lakes Engineering Works at a total cost of about $117,000.

The business across the straits, however, increased so rapidly that during the winter of 1925-26 it was found necessary to again enlarge the boats which was done by widening them eight feet on each side, thus giving them a beam of 44 feet instead of 28 feet as formerly. This increased the capacity of the boats fully 50 per cent, making it possible for each boat to carry between 55 and 60 cars. This work was also done by the Great Lakes Engineering Works at a total cost of $113,830. An illustrated article on this conversion appeared in Marine Review for July, 1926.

MICHIGAN may well look with pride to the efficient development and operation of the state ferry service between the Lower and Upper peninsulas at the Straits of Mackinac. During a period of less than ten years unusually well planned and attractively arranged terminals have been completed on each side and three suitable vessels especially designed to meet the requirements of this service have been placed in operation. All of this has been accomplished at a total capital expenditure of less than $1,650,000. What is more to the point, the receipts for service rendered through the period of development have been ample to meet not only all operating expenses but capital charges and depreciation so that it has not cost the taxpayer a single cent.

Editor's Note

At the beginning of the season of 1926, the tolls were reduced from $2.50 and $3.50 per car to a rate ranging from $2.00 to $3.50 per car, based on the overall length of the cars instead of the wheel base length as formerly.

Business of the state ferries continued to grow and by the end of the season of 1927 another boat was necessary. A contract was let to the Great Lakes Engineering Works, Detroit, for the third boat which was called THE STRAITS OF MACKINAC. This vessel is 212 feet in overall length and 48 feet in beam and can carry about 60 automobiles on the main deck. Its first cost was a little less than $330,000. As originally built this vessel was illustrated and described in MARINE REVIEW for April, 1929.

But the business still continued to grow and it was later found necessary to place an upper deck on all three boats, thus increasing the capacity of The Straits of Mackinac from 60 to between 85 and 90 cars and each of the other boats from 48 to 70 cars.

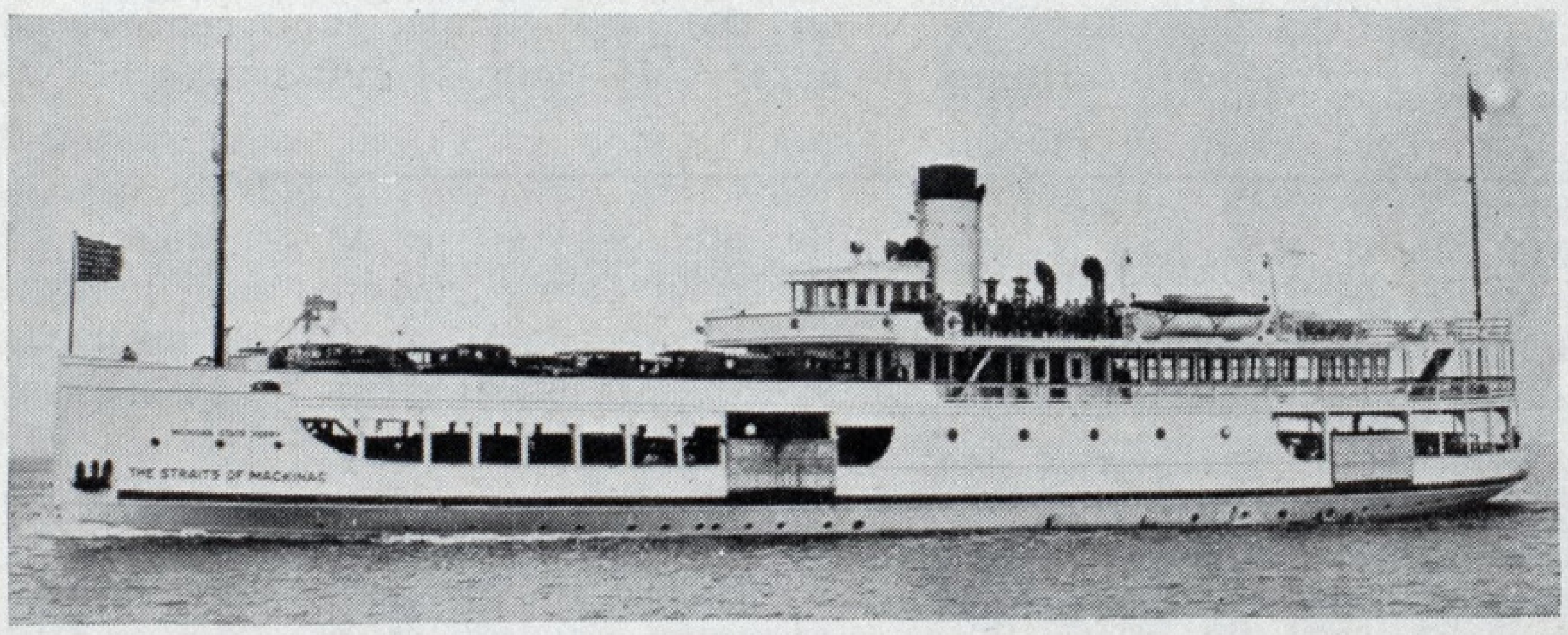
Rapid Increase of Business

How rapidly this business grew up to the end of 1929 and how much it has been affected by the depression since that date is clearly shown by the following table:

Year	Receipts
1923	$ 29,906.25
1924	113,860.50
1925	175,968.75
1926	199,628.75
1927	288,358.50
1928	334,103.25
1929	392,378.75
1930	396,183.00
1931	389,162.75
1932 (Partly est.)	290,000.00

With the carrying capacity of the boats increased as far as possible, it became evident that the only other way to speed up the service without added operating costs, would be to improve the dock facilities, thus shortening the time required to load and discharge cars. Therefore in 1930 and 1931 the Mackinaw City dock was extended outward some 300 feet in the form of a triangular pier head

(*Continued on Page 42*)



Above—State Ferry The Straits of Mackinac
At Right—State Ferry Sainte Ignace

Mariposa and Monterey Performance

Trial Results Confirmed in Service

By J. E. Burkhardt*

THE MARIPOSA was delivered to her owner in January, 1932. Much descriptive information and some trial data were published at that time. The object of this paper is to place before the society some of the more important results of the performance of the vessel on trial and in service, supplemented by data from the sister vessel, MONTEREY, completed in May, 1932. The principal dimensions and characteristics of the vessel are tabulated separately for convenience. Trial powers, revolutions and oil consumptions plotted on a base of speed show that the results of the MONTEREY closely confirm those of the MARIPOSA.

The criterion of economy in ship propulsion is the amount of fuel consumed at a given speed and displacement. The principal factors involved are:

1. The resistance of the hull; almost entirely a matter of lines or form.
2. Propulsive efficiency, controlled by the design of propeller and appendages, particularly those in the vicinity of the propeller.
3. Efficiency of propelling machinery as usually expressed by fuel consumed per shaft horsepower per hour.

Rarely are all these factors at the best in any one vessel. They will be considered in the above order for the MARIPOSA.

A Good Hull Form

Whether the resistance of the model is good or otherwise can perhaps best be determined by a comparison with Taylor's standard series, the models for which, from the point of view of resistance, were good and until the last few years were rarely improved upon in practice. Resistance of the MARIPOSA's model is 5 to 8 per cent less than the standard series at trial draft, 3 to 7 per cent less at 28 feet draft, and 2 to 5 per cent less at light draft. The maximum difference occurs at about 21 knots in all cases. This comparison is made from actual model resistances using the same frictional coefficient in both cases.

The lines of the MARIPOSA were developed after a careful study of model experimental data. The bow lines are decidedly hollow with a slightly bulbous forefoot, although the bulbous effect was adopted to facilitate construction rather than to reduce resistance. The after body was faired into a full cruiser stern.

The propulsive efficiency is the ratio of effective horsepower to shaft horsepower. Effective horsepower is obtained from the model towed at Washington and is for bare hull with rudder only. No other appendages are included.

It will be noted that this ratio is 0.595 at 20 knots—a good propulsive efficiency for a twin screw vessel. If the effective horsepower included all appendages, as is often done, the effect would be to increase this figure about 8 per cent. The aerofoil sections of the propeller blades and the careful fairing and fine run of the shaft bossing undoubtedly contributed to this result.

The main propelling machinery installation consists of geared turbines and watertube boilers designed for 400 pounds per square inch pressure and 675 degrees Fahr. temperature. The auxiliaries are electrically driven. Air heaters are fitted to the boilers, reducing the stack temperature to 310 degrees Fahr., resulting in a boiler efficiency of 85 per cent. The steam is expanded in three turbines to give a good efficiency while keeping the blade and steam speeds moderate in the interest of reliability.

The turbines are designed to maintain a reasonably low water rate at reduced powers and this is reflected in the oil consumption, the curve for which shows only a very moderate rise as power falls off in spite of the relatively high hotel load in this class of vessel.

The condensers are fitted with scoop circulation, which supplies plenty water, enough to insure 28½ inches of vacuum with a sea temperature of 84 degrees Fahr. without the use of pumps except while maneuvering.

Two stage feed heating is used and, to insure pure feed water, arrangements are provided for continuously evaporating, at very little fuel cost, all make-up feed for the boilers.

The engineering data obtained on the official twelve hour, oil consumption and endurance trial are given for both vessels in an accompanying table.

The fuel oil consumption curve is plotted through actual spots obtained on the sea trials (not reproduced here). At contract full power of 22,-

Mariposa Particulars

Length overall, feet, inches	631 6⅝
Length, designed l.w.l., feet, inches	628 0
Length between pp., feet, inches	605 0
Breadth, molded, feet, inches	79 0
Depth, to C deck, feet, inches	52 9
Draft, designed w.l., feet, inches	28 0
Displ., designed w.l. tons	26141
Block coefficient	0.651
Prismatic coefficient	0.657
Shaft horsepower, normal	22,000
Service speed, knots	20½

Twelve-Hour Oil Consumption and Endurance Trials

Nature of Data	Mariposa	Monterey
Date of Trial	Dec. 10-11. '31	Apr. 21-22. '32
Duration of trial. hours	12	12
Mean draft, feet, inches	25-4	25-3½
Displacement, tons	23,230	23,160
Speed of vessel, knots	21.3	21.4
Shaft horsepower	22,113	23,132
Shaft, revolutions per minute	124.7	125.5
Steam, press. in h.p. chest, lbs. per sq. in.	361.5	375.5
Abs. press. at l.p., turb. exh., in. Hg.	0.57	0.63
Turbine revolutions per minute	1,582	1,595
Press. at h.p. lbs. per sq. in.	75.5	83
Turbine exhaust temp., deg. F.	64	62.5
Condensate temperature, degrees F.	54	50.5
Main injection temp. deg. F.	44	42
Overboard discharge temp., degrees F.	49	46
Generator load, Kilowatts	556	596
Steam press. at boilers, lbs. per sq. in.	391	393
Total steam temp., superheater deg. F.	671	666
Feed Water temperature, degrees F.	314	314
CO_2 in flue gas, per cent	13.7	14.1
Temp. of uptake gases, deg. F.	309	317
Air temp. to burners, deg. F.	283	.....
Heating surface in use, sq. ft.	53,520	53,520
Fuel consumed, per hour, lbs.	13,785	14,396
Heat content of fuel used. B.t.u. per lb.	19,132	19,130
Equiv. fuel per hour @ 19,000 B.t.u. per lb.	13,880	14,495
Lb. oil per s.h.p. hr., all purposes @ 19,000 B.t.u.	0.627	0.626

*This article is a full abstract, omitting only the diagram, of paper No. 13, entitled *"Performance of The Mariposa and Monterey,"* prepared by J. E. Burkhardt, chief engineer of the Bethlehem Shipbuilding Corp., Quincy, Mass., and presented at the annual meeting of the Society of Naval Architects and Marine Engineers in New York, Nov. 18, 1932.

000 shaft horsepower the actual figures for the twelve-hour trial are 0.627 for the MARIPOSA and 0.626 for the MONTEREY, which is a satisfactory result, bearing in mind that although machinery is of modern type, it does not include some of the finer economical features such as three-stage feed heating and diesel driven generators which, though they reduce the fuel rate by a few points, do so only at a relatively large increased first cost.

Results obtained on the first round voyage of the MONTEREY to Australia indicate a close adherence to the curve, in some instances being below and in some slightly above and elsewhere right on the curve. They are derived from the chief engineer's log of the voyage and undoubtedly contain discrepancies due to the usual difficulties in obtaining accurate average horsepower by the ship's force in ordinary operating conditions.

The oil consumed is much easier to measure and is probably accurate. On the first round voyage to Australia the consumption at sea for the MARIPOSA was 31,965 barrels and for the MONTEREY 32,638 barrels. The total distance is 16,700 nautical miles, and the average speed 19.58 knots for the MARIPOSA and 19.80 knots for the MONTEREY.

It is of interest to compare these actual oil consumptions with the trial data. Assuming that the speeds indicated had been kept constant over the whole voyage, the actual fuel consumptions are 15 per cent and 19 per cent, respectively, higher than those obtained from the trial data. Considered in this overall way, this does not appear to be an unreasonable allowance for current, wind, weather, condition of bottom and the usual limitations of practical ship operation.

High Propulsive Efficiency

Since all three of the factors affecting economy of propulsion seem to have turned out well for these vessels, it was desired to determine, if possible, the position the MARIPOSA and the MONTEREY occupy among the vessels of their class in this respect. To compare in a fair manner, the overall performance of vessels is always a matter of difficulty, but the conventional fuel coefficient

$$\frac{(\text{displacement}^{2/3} \times V^3)}{\text{tons of oil per day}}$$

has the advantage of simplicity and is perhaps the most useful for this purpose. It is based on the admiralty formula, itself a reliable criterion of propulsive efficiency and form when applied to similar ships.

Comparisons on this basis will be reasonably accurate if the displacement-ratios and the speed-length ratios were the same in all vessels. Unfortunately this is not always the case but due consideration can be given to it. In general, vessels compared at displacements lighter than normal show to their disadvantage.

Comparison With Other Vessels

For the comparison, trial data of five vessels of approximately 600 feet in length, 20 knots speed, and having contemporary modern machinery were available, namely, the VICEROY OF INDIA, EMPRESS OF AUSTRALIA, DUCHESS OF YORK, PRESIDENT HOOVER, and the MANHATTAN. The admiralty co-efficient and fuel coefficient have been averaged and compared with the MARIPOSA at her contract full power, and are shown in an accompanying table.

It will be noted that the displacement length ratio of the MARIPOSA is within 1 per cent of the average of the other five vessels. The speed-length ratio of the MARIPOSA is some 6 per cent in excess of the average, which is not to the advantage of the MARIPOSA since resistance at these speed length ratios increases somewhat faster than the cube of the speed.

It will also be noted that the figures in the table indicate that the MARIPOSA and MONTEREY are superior in economy of propulsion by a substantial amount, approximately 20 per cent better than the average of the other vessels, a fact that is not brought out by consideration of the recorded figures in oil per shaft horsepower alone.

Owing to the great attention that has been given to propelling machinery in recent years and the consequent necessity for some criterion for comparison of this important feature, oil per shaft horsepower has tended to assume, in the mind of shipping people, a paramount position to the exclusion of other factors of almost equal imoprtance.

Comparative Trial Data of Mariposa and Others

Nature of Data	Mariposa	Five Vessels Lowest	Five Vessels Average	Five Vessels Highest
Speed-length ratio	0.849	0.758	0.802	0.836
Displacement-length ratio	94	78.5	93	105
Pound of fuel, per s.h.p. per hr. (all purposes)	0.627	0.602	0.648	0.71
Admiralty coefficient	354	286	299	308
Fuel coefficient	52,500	38,700	43,200	47,000

The next annual meeting of the Institution of Naval Architects will be held at London on April 5, next.

The thirty-third annual convention of the International Acetylene association was held at Philadelphia, Nov. 16, 17 and 18.

The United States Should Ratify Safety Rules

The importance of ratifying the international convention on safety of life at sea is emphasized by A. J. Tyrer, commissioner of navigation, in his annual report. It is pointed out that this convention which was signed in London, in 1929, by 18 representatives of the chief maritime nations, is perhaps the most comprehensive international agreement, affecting the safety of life and property in our merchant marine, which has ever been effected.

Declaring that, "the interests of the United States in its provisions are as great as those of any other country," the commissioner said. "Should the United States fail to ratify the convention, it is not improbable that very considerable delay and obstruction to commerce will result in the case of our vessels doing business out of foreign ports." The convention, the report explains, will come up for ratification at the coming session of congress.

Pointing to the anomolous situation which now exists due to the fact that various duties coming under the supervision of his office are performed by personnel at present attached to the treasury department, Commissioner Tyrer recommended in the interests of efficiency and economy that these men be placed under the direct control of the secretary of commerce.

That American vessels generally adhere closely to the laws and regulations pertaining to navigation is shown by the fact that as a result of 31,000 inspections made by the bureau of navigation, only 3700 violations were disclosed. In other words, it was necessary to inspect approximately ten vessels before even a technical infraction of the law was found.

Repairs on the Rex

MARINE REVIEW has received the following communication, quoted in part, from the Westinghouse Electric & Mfg. Co.: Westinghouse made repairs to the auxiliary turbines of the REX on her arrival in New York on her first voyage with the result that an erroneous rumor was circulated that these were Westinghouse machines.

"The turbines on the REX are not of Westinghouse design, but were built by an Italian shipyard under Parsons license. There is no Italian Westinghouse company."

The Nobel award in chemistry for 1932, the greatest recognition that any scientist can receive, will be presented to Dr. Irving Langmuir, associate director of the General Electric research laboratory, in Stockholm on Dec. 10.

Shipbuilder Installs New Equipment

Heat Treating, Inspection and Welding

By P. E. Shaver

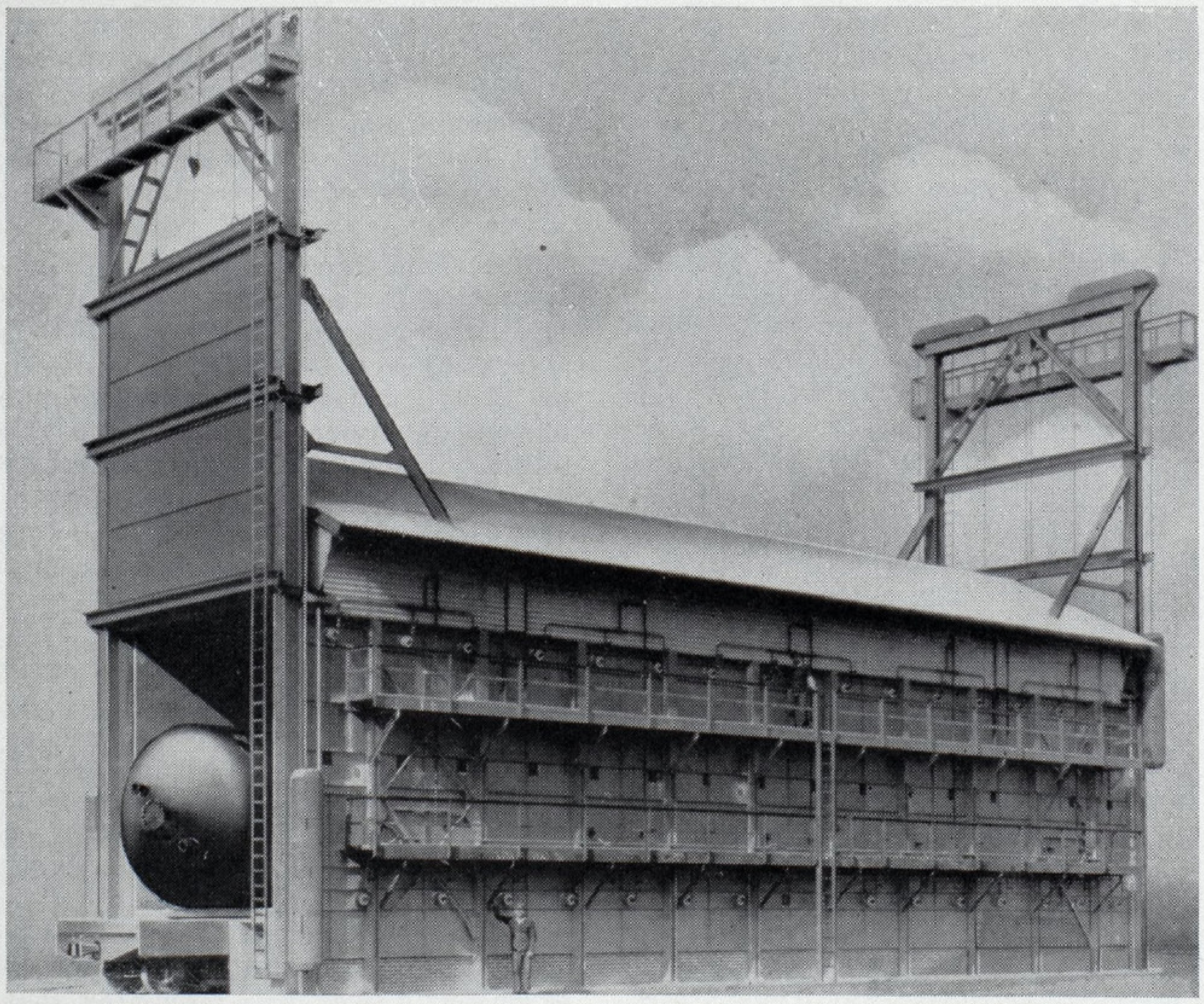
MODERN methods of steel construction and building of machinery has brought into use new equipment and procedures in marine work. In step with this modern trend, the Sun Shipbuilding & Dry Dock Co., Chester, Pa., has recently put into service considerable new equipment.

In addition, to shipbuilding, drydocking marine repairs and the building of diesel engines, this company for some years built special machinery, pressure vessels, plate work, etc., for oil refineries and kindred industries. Since much of this equipment is of welded construction, it was decided to install special shop equipment such as welding facilities, an X-ray inspection outfit, annealing furnace for stress relieving welded work, and machines for turning large tanks and boilers while being welded. After considerable study and investigation, the policy was adopted of designing this new equipment to apply to shipbuilding needs as well.

The author, P. E. Shaver, is Sales Engineer of the Sun Shipbuilding & Dry Dock Co., Chester, Pa.

Ordinarily a furnace for stress relieving welded pressure vessels for land work need not be larger than the largest dimensions for railway shipping clearances, or approximately 11 feet 6 inches diameter by about 80 feet long. To broaden the scope of this furnace, it was built to accommodate vessels 17 feet diameter and lengths up to 150 feet or even longer if necessary. In addition to annealing large welded pressure vessels to relieve all welding stresses, this furnace is used for annealing large castings and large sections of welded steel work, thus making it suitable for application to shipbuilding.

Likewise, the X-ray inspection outfit was not only designed for routine examinations of welded seams of pressure vessels, but it is also adapted for examining castings, forgings and other objects and it will be invaluable in examinations of many materials heretofore on the doubtful list. A welding procedure and the necessary shop equipment for handling work has also been designed and put into operation at this yard. A description of this unique equipment, heretofore unknown in a shipyard, follows.



Stress relieving or annealing furnace installed at the Sun Shipbuilding & Dry Dock Co. Believed to be the largest of its type

The new annealing furnace is shown in accompanying illustration. It is believed to be the largest furnace of its type yet to be built anywhere. The general dimensions of the furnace are, inside length 80 feet, overall length, 82 feet, inside width 18 feet, outside width 19 feet 6 inches, inside height above support level 19 feet 6 inches, total volume 28,000 cubic feet. The furnace is built of structural steel framing, with a steel casing as the outer shell and is lined with a special light weight insulating brick 9 inches thick. The insulating brick are fastened to the steel by means of lag screws. A catenary arch type of furnace roof is used. For weather protection there is a composition roof covering the entire furnace.

The furnace may be operated at any desired temperature up to 2400 degrees Fahr. Any temperature within this range may be uniformly held in control through the use of automatic equipment. Design of the furnace is such that any portion of it may be used according to the size of the equipment to be stress relieved. Ends of the furnace are covered by two doors of the vertical lift type. The doors are operated by an electric motor through a counterweight system and push button control. A portable removal bulkhead is used when only a small portion of the furnace is required.

A vessel to be annealed is placed on a special car or cars, depending on its length, and moved on rails within the permanent effective furnace structure. The effective heating length is 80 feet with an extreme width of 17 feet. When annealing vessels over 80 feet in length, the vessel is placed on more than one car and one end is placed in the furnace and annealed after bricking up around the opening between the vessel and the furnace walls, with the door at that end in raised position, then the cars are pulled through the furnace structure so that the annealed portion protrudes out of the opposite end and to the proper position for annealing the other end in a like manner.

The furnace is gas heated with surface type burners, each burner having a capacity of 618 cubic feet per hour of 530 B.t.u. gas operating

at 10 pounds pressure per square inch. A total of 62 burners are installed at two levels on each side of the furnace in staggered positions. The gas consumed with all burners on is 38,316 cubic feet per hour. The location and type of burner is such that there is no local overheating. The ventilation is obtained by means of openings located in the side walls, the amount of vent space in these openings being controlled by dampers.

Exact temperature control is obtained by the use of automatic temperature control valves, each operating 6 burners per side or a total of 12 burners per control valve. The furnace is thus divided into five heating zones with a control valve for each zone. The valves are actuated by a thermocouple inserted in the gas space at locations depending upon the type of equipment to be annealed. Temperature recording instruments are provided to record the temperatures of the walls of the vessel at various locations.

Additional temperature recorders give a record of gas temperatures at various locations in the furnace. A total of 16 temperatures are recorded on this equipment. In addition to the recording temperature instruments, a set of indicating instruments are used which makes it possible to quickly and accurately determine the temperature in many locations on the vessel being annealed and throughout the furnace. A total of 12 points are connected to the indicating instruments.

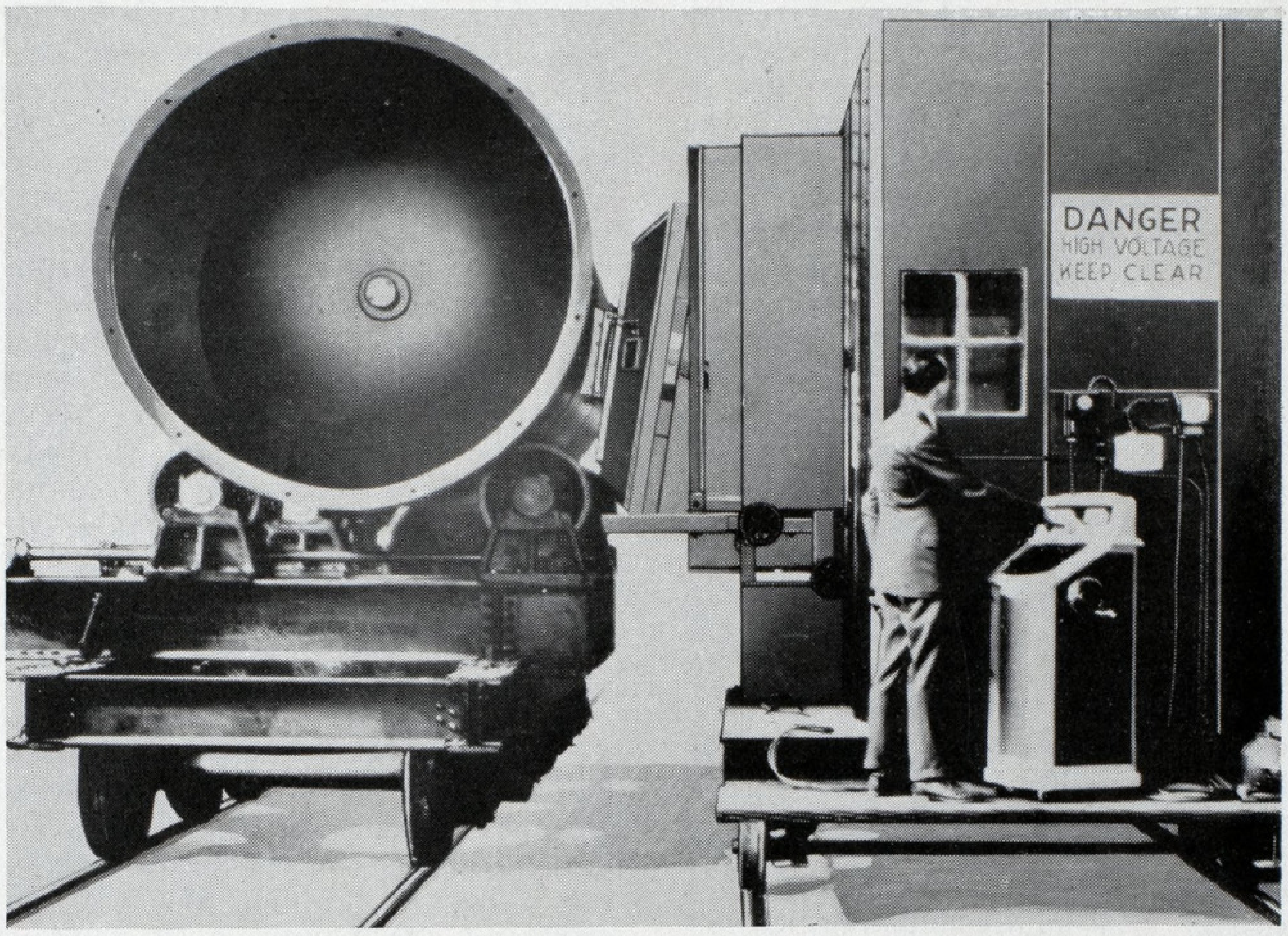
This furnace was designed by the company's engineering department in conjunction with the engineering departments of the companies supplying the equipment and materials used. Erection was done entirely with the shipyard's own force.

The X-ray inspection outfit was designed and installed by the St. John X-ray Service Corp. Flexibility and convenience have been secured by a coordinating system of supporting and rotating the welded vessels which are to be examined and of supporting and shifting the X-ray tube. The welded vessels or objects to be examined are supported on two sets of movable tables each mounted on a truck, these tables being moved along a track to accommodate different lengths of objects.

The X-ray generator and tube are mounted on a car on a second track which is parallel to the gear driven rolls as shown in an accompanying illustration. The X-ray tube is enclosed in a lead lined box provided with an opening on the side toward the vessel. This box is mounted in trunnions so that it can be tilted to the X-ray beam merging through the window at any angle between 30 degrees below horizontal and 30 degrees above. The trunnion frame is movable across the car to permit proper approach to vessels ranging in size from 2 feet diameter and larger. These motions are controlled by handwheels.

A slow speed electric drive, controlled from a portable push button station moves the X-ray car along its tracks. The movable tables are moved to position in front of the X-ray tube by movement of their trucks on the rails either manually or by electric motor.

Auxiliary lead shields between the X-ray box and the outer surface of the vessel being X-rayed are attached to the box itself and adjust themselves to the contour of the outer surface as the tube is moved ino position, while similar auxiliary shields attached to the film carrier adjust themselves to the contour of the inner surface when the carrier is placed into position. The film carrier is moved along an adjustable rail for the longitudinal seams and is held by adjustable stops for the girth seams and is removed only when passing from one seam to the other. Similarly adjustments are made for flat work.



X-ray Generator and Tube mounted on a car. For inspection of material for flaws or imperfect workmanship

Transformers for the X-ray tube and all high voltage connections are enclosed in a metal housing on the X-ray car and with the car itself are thoroughly grounded to the rails. There are safety devices to prevent entry to the high voltage enclosure while the current is on. For examination of smaller castings, forgings and miscellaneous articles a special lead lined booth is placed on the tracks on which the movable tables operate. This booth is so arranged that the top and sides are removable so that it will be accessible for placing the castings and parts to be X-rayed within. After the object to be X-rayed is placed in the booth, these sides and top are placed back into position completely enclosing the object.

A dark room for developing and handling films is located near the X-ray machine and is conveniently arranged and completely equipped.

Pressure vessels and welded work is done by an automatic welding process, which has been installed consisting of the latest improved devices for automatic control and this work while being welded is handled on a large power driven turning table 120 feet long with weight capacity of 280,000 pounds, so designed as to permit a welding speed of 12 to 48 feet per hour. The welding process now in use at the Sun Shipbuilding & Dry Dock Co. is known as "Sunweld."

Welding, stress relieving and X-raying is done under the supervision of expert metallurgists. This equipment was inspected by a delegation attending the American Welding Society and the International Acetylene association meeting which was held in Philadelphia in November.

Change in Personnel

A recent announcement by the Sperry Gyroscope Co. Inc., Brooklyn, N. Y., gives the following changes in executive personnel:

Thomas A. Morgan, formerly president, is now chairman of the board; R. E. Gillmor, formerly vice president and general manager, becomes president and general manager; P. R. Bassett, for many years chief engineer, has been appointed vice president in charge of engineering; and Robert B. Lea becomes vice president in charge of sales.

Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review

By Harry Bowne Skillman

Attorney at Law

STATUTES limiting shipowner's liability to value of interest in vessel and freight do not interfere with the enforcement of a specific contract making the shipowner liable in excess of the amount or value of the interest of such owner in such vessel, and her freight then pending, it was decided in the case of PHILIP J. KENNY, 57 F. (2d) 337. It was further held that a freight contract making the owner liable for all claims arising out of ownership, maintenance, navigation, operation, control, or possession of a barge did not make the owner personally liable for damage to property of a lessee of space thereon.

* * *

A VESSEL saving coffee from a stranded vessel was held, in the case of Huastica Petroleum Co. v. 27,907 Bags of Coffee, 58 F. (2d) 374, entitled to a salvage award based on her value without deduction on the ground that an ordinary tug would have served the purpose. A specially equipped salvage vessel, making a special trip and conducting salvage operations requiring 13 days at the salvor's expense, was held entitled to a bounty of 20 per cent of the salved value of the vessel.

* * *

IN CLIFFORD v. Merritt-Chapman & Scott Corp., 57 F. (2d) 1021, it was declared that a tug furnishes power and pilotage to a vessel, that she may earn her freight. The tug owner has, under the statutes, a lien on the ship. There is ordinarily no lien on the cargo beyond the freight, for the tower is furnishing only what the ship is bound to furnish as consideration for the freight. There may be circumstances of necessity not giving rise to salvage which will raise a towage lien on the cargo, but they must be such as to empower the master to hypothecate the cargo and justify the tower in understanding that the cargo was intended to be thus burdened.

* * *

THE privity or knowledge which removes a case from the operation of the limitation of liability law, said the court in the case of YUNGAY, 58 F. (2d) 352, involves a personal participation of the owner in some fault or act of negligence causing or contributing to the injury. Ordinarily the owner may rest his duty to make a ship seaworthy upon a suitable agent, and thus be relieved under the limitation act, where he has no notice or knowledge of the agent's negligent performance of the duty, but the burden or proving this lack of privity or knowledge, his own nonparticipation in the fault or negligence causing the injury is upon the owner. The act would fail of its purpose, the encouragement of the business of navigation, if full liability should be visited upon owners through the creation and imposition on them of nondelegable duties. The court then held that the owner, who was not a navigator, was not obliged to study the science of navigation or acquire expert knowledge concerning his vessel and equipment before sending her out, and hence that it could not be said that at his own peril he left the adjustment of compasses to another.

* * *

IF THE tugmaster neglects to see to it that a barge which he adds to a flotilla is so moored as not to overburden the fasts of the inside barges, the owner of the tug, and not the owner of the barge, is at fault.—BARTLE DALY, 58 F. (2d) 179.

* * *

AN OVERTAKING vessel has the duty of procuring an assent to a safe passing, and of acting with notice that the vessel ahead might at any time, in advance of a signal from the following vessel, asking assent to the passing, do something that would interfere with the safe passing.—SOCONY No. 115, 58 F. (2d) 392.

* * *

THE difference between an open and a valued policy of insurance upon a cargo was considered in the case of St. Paul Fire & Marine Insurance Co. v. Pure Oil Co., 58 F. (2d) 393, where the court said: "In an open policy the value of the property insured is not definitely agreed upon in advance. Only a measure is laid down, such as market value. If a mutual mistake as to value is afterwards made in adjusting and paying the loss, neither party is foreclosed in complaining of the mistake later on. Relief can be had as in any other case of mutual mistake of fact. In a valued policy, however, the value of the subject matter is agreed upon beforehand at a specified sum. Dispute on that subject is then foreclosed for all time thereafter, except in case of fraud or wager. It is possible therefore for the insured to recover under a valued policy more than the actual value of the subject of the insurance. At first sight this result may appear out of touch with the general principle that a contract of insurance is one of indemnity. It is supported, however, by the view that the parties may agree in advance in estimating the value of the matter insured by way of liquidated damages. A large overvaluation by the insured may of course furnish evidence bearing on fraud. * * * The mere insertion of the amount of the insurance does not render the insurance valued; but the addition of the valuation clause, setting forth both a value on the entire shipment and a value on each barrel, does have that effect. Policy and certificate combined make up the contract of insurance. In any feature wherein the two are in conflict, the certificate, issued later, is deemed a modification of the blanket policy and is controlling."

* * *

SELLER of a motor installed in a vessel sought to be forfeited for engaging in an unlicensed trade is not entitled to a maritime lien because the vessel was originally sold under a conditional bill of sale and the seller of the motor wholly failed to inquire of the conditional seller as to terms of the contract, notwithstanding knowledge of the conditional sale and provision therein forbidding maritime liens, thereby leaving the conditional vendees without authority to pledge the credit of the vessel.—OLYMPIA, 58 F. (2d) 638.

* * *

FACT that an alien had fraudulently obtained documents showing United States citizenship was not sufficient to relieve a steamship carrier from liability for fine, if prior to departure of the vessel carrier could have ascertained by reasonable diligence that the individual transported was an immigrant. However, such carrier issuing a passage ticket in reliance on a birth certificate which came from official sources in Puerto Rico and purported to sustain the claim of citizenship could recover fine and passage money refunds exacted for bringing an alien to Puerto Rico.—New York & Puerto Rico Steamship Co. v. United States, 58 F. (2d) 827.

Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	253	1,379,283	244	1,328,561
September	258	1,634,448	266	1,658,521
August	287	1,754,583	270	1,636,803
July	238	1,483,476	254	1,553,215
June	267	1,579,970	277	1,650,915
May	277	1,484,116	259	1,392,451
April	270	1,506,696	277	1,515,147
March	332	1,982,670	375	2,070,546
February	312	1,875,981	322	1,776,394
January, 1932	297	1,821,335	305	1,719,978

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	57	167,539	42	115,660
September	45	123,049	36	99,766
August	64	175,530	43	113,901
July	49	130,439	38	85,956
June	55	157,399	36	102,354
May	66	205,184	46	142,889
April	55	165,646	51	159,427
March	57	186,479	45	151,190
February	49	150,899	34	98,667
January, 1932	51	168,266	36	114,982

Boston

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	99	332,754	68	249,150
September	114	337,608	91	283,227
August	117	369,799	103	339,775
July	121	408,896	101	346,926
June	116	342,057	95	322,558
May	125	294,093	97	257,608
April	103	308,951	72	215,237
March	99	319,863	65	217,992
February	107	315,036	63	213,166
January, 1932	94	286,508	61	208,491

Portland, Me.

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	8	21,407	7	18,228
September	9	14,698	9	16,526
August	14	25,844	14	24,208
July	9	15,156	10	17,733
June	10	25,895	11	26,519
May	14	26,484	14	29,669
April	10	22,911	10	24,483
March	14	41,083	13	35,993
February	20	53,793	20	56,558
January, 1932	13	28,179	14	28,955

Providence

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	3	13,133	3	9,683
September	3	11,450	4	14,471
August	5	13,418	1	5,071
July	2	5,918	2	9,634
June	7	22,359	3	7,151
May	7	24,204	....	....
April	4	17,438	3	13,515
March	8	35,293	5	24,289
February	5	19,442	4	18,533
January, 1932	8	41,147	4	21,654

Portland, Oreg.

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	25	98,792	45	182,167
September	25	98,370	37	146,945
August	22	93,256	32	127,572
July	21	84,961	24	99,035
June	20	80,272	25	98,356
May	20	82,750	25	99,862
April	23	83,171	28	104,796
March	26	103,924	36	142,050
February	32	127,810	36	149,417
January, 1932	27	112,542	42	168,762

Baltimore

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	98	281,907	94	281,534
September	66	190,459	80	241,287
August	88	243,077	87	245,091
July	88	255,354	86	255,209
June	95	299,502	97	294,264
May	95	289,042	102	317,751
April	108	346,276	114	377,317
March	96	288,052	105	319,511
February	105	337,487	98	323,603
January	95	301,958	102	328,876
December, 1931	102	330,709	106	354,320

Norfolk and Newport News

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	15	60,775	36	80,792
September	26	74,483	53	118,437
August	25	53,025	37	86,952
July	23	72,755	36	91,332
June	18	51,803	48	114,222
May	24	52,049	43	112,672
April	22	59,932	33	77,515
March	33	79,948	42	99,939
February	22	68,136	48	121,647
January, 1932	17	53,536	38	104,392

Jacksonville

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	8	16,714	8	13,659
September	7	15,879	7	12,539
August	8	14,142	9	16,647
July	8	20,558	7	16,963
June	7	12,746	10	20,277
May	12	33,157	8	20,489
April	9	17,886	9	21,812
March	8	15,560	13	26,457
February	8	18,785	10	21,812
January, 1932	8	26,601	12	27,759

Key West

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	35	62,394	35	62,394
September	36	60,309	36	61,405
August	37	66,432	37	66,313
July	38	62,503	40	62,486
June	37	61,115	39	76,274
May	56	76,236	55	76,070
April	55	77,443	50	80,778
March	41	61,078	39	59,069
February	39	59,334	39	66,392
January, 1932	43	67,913	42	71,873

Mobile

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	105	228,041	105	233,510
September	89	166,896	96	193,213
August	90	196,453	88	188,375
July	107	222,810	99	203,444
June	91	207,178	93	201,443
May	102	212,215	97	198,871
April	102	192,617	104	202,965
March	97	204,645	98	211,921
February	101	235,846	96	219,215
January, 1932	110	253,792	112	242,378

Seattle

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	53	235,224	58	251,334
September	40	168,740	40	175,635
August	39	183,141	36	167,807
July	32	145,560	36	162,923
June	36	160,585	32	143,574
May	43	184,393	41	170,652
April	40	171,346	43	191,352
March	43	190,082	43	180,862
February	50	217,837	54	232,138
January, 1932	48	200,281	50	216,819

New Orleans

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	140	403,062	150	424,621
September	151	423,791	139	415,704
August	160	448,826	156	442,655
July	166	438,496	171	448,198
June	170	597,552	164	457,960
May	182	517,523	169	472,154
April	192	558,631	194	559,824
March	200	604,269	196	589,805
February	157	436,882	169	469,296
January, 1932	171	516,707	171	506,411

Charleston

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	14	33,693	12	34,625
September	21	54,638	20	52,035
August	15	29,293	18	46,756
July	17	39,628	14	39,844
June	26	80,438	25	78,864
May	29	80,415	27	71,288
April	21	53,404	21	57,341
March	37	131,723	36	110,353
February	32	88,616	27	75,262
January, 1932	24	73,488	22	16,217

Galveston

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	26	54,231	94	277,977
September	25	38,083	85	236,532
August	29	44,389	71	202,598
July	27	50,302	79	220,489
June	28	47,046	81	226,542
May	38	84,468	86	259,026
April	44	97,609	106	297,282
March	32	61,079	109	319,013
February	27	64,866	101	317,095
January	26	73,215	92	292,274
December, 1931	37	113,327	111	358,950

Los Angeles

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	209	641,131	201	657,641
September	223	581,402	222	610,443
August	253	653,836	244	635,164
July	226	646,417	230	617,947
June	168	588,184	162	558,945
May	229	691,109	164	650,539
April	189	617,325	222	635,301
March	168	622,067	188	611,770
February	164	627,876	158	622,730
January, 1932	144	578,699	149	594,384

San Francisco

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	147	669,637	166	727,969
September	136	608,268	153	667,866
August	152	640,952	162	702,483
July	148	687,695	142	655,436
June	133	588,465	132	590,158
May	154	669,735	152	649,509
April	146	663,647	144	613,085
March	139	645,331	162	709,778
February	149	638,222	144	583,030
January, 1932	145	635,218	147	646,987

Houston

(Exclusive of Domestic)

	—Entrances—		—Clearances—	
Month	No. ships	Net tonnage	No. ships	Net tonnage
October, 1932	21	81,274	37	136,509
September	23	103,424	33	121,134
August	11	47,148	32	116,860
July	17	66,968	20	87,589
June	20	93,807	31	119,752
May	29	122,192	36	149,039
April	31	131,585	39	155,861
March	27	113,624	43	167,956
February	25	103,589	43	162,236
January, 1932	25	108,322	36	145,084

Note: The figures given in this table are for direct entrances and clearances. Additional vessels in foreign trade enter and clear from and to other American ports after original entry and before final departure. At the port of Philadelphia, for instance, additional vessels in the foreign trade in this category were 57 of 197,813 net tons entered and 64 of 219,897 net tons cleared for the month of October.

Latest Data on New Marine Work

Information on New Ships Ordered—Building and Repair Contracts Let—Shipping Board Loans Made, Authorized or Pending

ON NOV. 7 there appeared in the English press an announcement to the effect that work would shortly be resumed on the Cunard superliner "534" now on the stocks at John Brown's Shipyard, Clydebank, Scotland. On the next day an official denial was issued by the Cunard Steamship Co. as follows: "With reference to the reports on the subject of the re-starting of work on the Cunard company's new steamer "534", the company wishes to say that the statements in question had been made without its authority and the position, as far as the company is concerned, is just the same as indicated by the chairman in his speech to shareholders at the annual meeting.

"As soon as the company is able to issue an authoritative statement, this will be communicated to the public."

At the annual meeting last April, referred to in this statement, Sir Percy Bates, chairman of the Cunard company said: "Work on the ship is still suspended, and I am not able to state at what date it will be resumed."

Reference to the matter was made by the prime minister in the house of commons, in which he said that no grounds could be found for the statements published.

The United States Engineer office, Montgomery, Ala., will receive bids until 2 p.m., Dec. 5, for furnishing all labor and materials and performing all work for dredging in the narrows in Santa Rosa sound, Fla., and in Blackwater river, Fla., a total of 511,900 cubic yards. Further information will be supplied.

The United States Engineer office at New Orleans, accepted bids until Nov. 30 for removal and disposal of the wreck of the schooner, BERTHA M. LATOUR, sunk in the Mississippi river opposite Chelmette slip in New Orleans harbor.

To Build New Vessel

W. F. Kenny, New York, president of the New Jersey Clay Products Co., on Oct. 26 placed a contract with the United Dry Docks Inc., for the construction of a 1200-ton steel vessel.

Designed by Henry J. Gielow Inc., New York naval architects, the new vessel will be 185 feet long, 43 feet beam, 19 feet in depth and will have a draft of 9½ feet. The propelling power will be two 450 horsepower each, Winton diesel engines. The vessel will be built at the Staten Island, N. Y. plant of the United Dry Docks Inc., and will be unique in that she will be one of the first large vessels to be constructed of welded channels instead of riveted plates.

Delivery is scheduled for Feb. 15. When completed the new vessel will be used to carry hollow tile from the plant of the New Jersey Clay Products Co. at South River, N. J., to ports on the Atlantic seaboard. On inbound voyages she will also engage in coastal trade. Mr. Kenny pointed out that, in view of the low cost of materials together with the aid which new construction will give to employment, it is more advisable at this time to build new tonnage than to try to recondition old vessels. He also called attention to the effect of shipping by water in the immediate reduction of the cost of building materials which will encourage new construction work resulting in further employment.

Santa Elena Launched

The fourth Grace liner, the SANTA ELENA, under construction at the Federal Shipbuilding & Dry Dock Co., was scheduled for launching Nov. 30.

Miss Elise Grace, daughter of William Russell Grace, director of W. R. Grace & Co., and vice president of the Ingersoll-Rand Co., has been selected to christen the ship as official sponsor. She is the grand-daughter of the late William R. Grace, founder of the company bearing his name. All four of these ships are being launched during the one hundredth anniversary year of his birth.

With the completion of the SANTA ELENA, the $20,000,000 new ship construction program carried out by the Grace line under the provision of the Jones-White merchant marine act of 1928 will be an accomplished fact. The SANTA ELENA will slide down the ways just four days after her first sistership the SANTA ROSA, sets out on her maiden voyage from New York, Nov. 26, for Havana, Panama, the West Coast of Central America, Mexico, California, Victoria, B. C., and Seattle. Following the SANTA ROSA will be the SANTA PAULA on January 30, and the SANTA LUCIA on March 13. First sailing for the SANTA ELENA is now scheduled tentatively for next April. Elsewhere in this issue appears an illustrated description of the SANTA ROSA, first of these four magnificent American sisterships.

Distribute Ship Scrapping

In the November issue of MARINE REVIEW it was noted that the shipping board had accepted the bid of the Boston Iron & Metal Co., Baltimore, to the dismantling and scrapping of 124 surplus ships. On Nov. 1 the shipping board definitely authorized the placing of this contract which calls for $1.51 per gross ton of recoverable scrap, work to be done over a period of three years, with a requirement of not less than three ships scrapped each month.

Negotiations are now pending, with the board's approval, to sublet a number of these ships to the Federal Shipbuilding & Dry Dock Co., Kearny, N. J., the Sun Shipbuilding & Dry Dock Co., Chester, Pa., and a yard in or about New Orleans or Mobile, to handle ships in the Gulf.

The board feels that it has made a great stride in disposing of this number of surplus and useless vessels hanging over the American shipping market. Their disposition will also affect economies by reducing layup expenses. The paramount object attained, however, is the employment which this plan will furnish to idle yards and unemployed workmen. It is estimated that this group of ships will furnish work to over 600 men for three years.

Share Jobs in Navy Yard

By orders from the navy department, the navy yard at New York will rotate its employes on a regular schedule of furloughs without pay. This order was issued on Nov. 17, and will presumably apply equally to other naval establishments. In the Brooklyn navy yard, it will affect 2200 men of the 3200 now employed.

There has already existed in this navy yard a voluntary system of work sharing. The new order makes it mandatory by law and will put it into effect more generally affecting all but about 1000 employes. The usual length of a furlough is 35 days. Major work in the Brooklyn navy yard at the present time consists of preparatory work in the building of two destroyers and some work on the new treaty cruiser, NEW ORLEANS.

Bids Asked on Cruiser

The secretary of the navy has announced that bids will be opened on Dec. 14 on a 10,000-ton 8-inch gun cruiser. It is understood that the private shipyards will bid on the construction of this cruiser which, complete with armament, will cost approximately $17,000,000. The new vessel is to be completed in 1936.

The navy program for 1933 also calls for three replacement destroyers provided for in the construction provisions of the emergency relief act. It is further stated that funds may be sought for four additional destroyers, already authorized by the congress.

The new cruiser is the sixteenth of this type built under the London treaty. The seventeenth cruiser can be started in 1934, and the eighteenth in 1935, each to be finished in three years respectively from the time that they are laid down.

Traveling by Freight

For the first time in the sixty-seven years since it was established, the Luckenbach Steamship Co. is now offering a limited passenger service. Its entire fleet of twenty-one modern freighters ranging from 8360 to 14,200 tons has undergone extensive alterations to provide unusual comforts for from one to ten passengers on each ship.

The new plan applies to all Luchenbach ships plying from Boston, New York and Philadelphia through the Panama canal without intermediate stops to Los Angeles, San Francisco, Portland and Seattle, and to those vessels running to the same west coast ports from Mobile, New Orleans, and Houston. The rates are considerably below those of passenger liners.

The company is appealing particularly to the tired business man under the slogan, "travel by freight," and stresses the absence of music, dancing, jazz and other distractions. Commodious cabins, located amidships, with private bath, unusual clothing space, good reading lights, electric fans and well fitted wash basins with hot and cold water are among the facilities offered. The passengers dine at the captain's table. Additional accommodations will be installed if demand warrants.

Four distinct services are offered. On the intercoastal service between eastern and western ports, in both directions, there is a sailing every week. The trip between San Francisco, and New York, going through the canal by daylight, takes 18½ to 22 days. On the gulf service, between Pacific ports and the Gulf cities, there is a sailing every two weeks. The trip from San Francisco to New Orleans takes about 20 days. On this service the ships also go through the Panama canal by daylight.

Welded Construction

Gas, oil and water—but no free air—are dispensed from a recently completed arc welded steel floating service station which supplies the need of water craft in Boston harbor.

Constructed by the A. F. Robinson Boiler Works, Cambridge, Mass., the barge is 75 feet long with an 18-foot beam and a depth of 7½ feet. The plate used throughout is $\frac{5}{16}$-inch in thickness, butt welded by the shielded arc process using electrodes and welders manufactured by The Lincoln Electric Co., Cleveland. All parts of the craft including hatch covers, supply house, pipe connections and fittings were arc welded.

The barge has a capacity of 30,000 gallons of gasoline, and weighs approximately 35 tons. Constructed inland, it was transported to the waterfront on a heavy duty truck and launched directly from the truck.

Launch Coast Guard Cutter

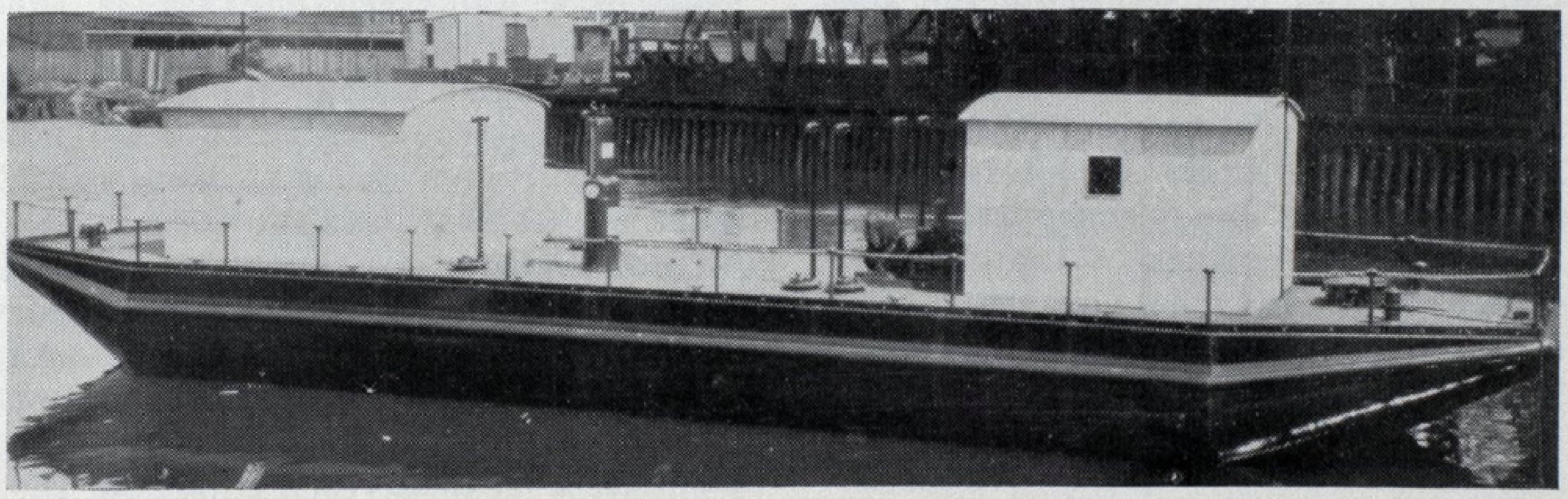
The new coast guard cutter, ARGO, building at the John H. Mathis Co., shipyard Camden, N. J., was launched on Nov. 12. The sponsor was Mrs. Frances Hamlet, wife of Rear Admiral H. G. Hamlet, commandant of the United States coast guard.

The new cutter is an all steel craft 165 feet long and generally similar to the seven patrol boats completed some time ago by the Bath Iron Works Corp. The crew will include forty men and five officers. She is to be capable of a speed of 18 miles an hour. The GALATEA, a sister vessel, is now under construction at the same shipyard.

The New York Shipbuilding Co., Camden, N. J., has delivered the new cruiser, INDIANAPOLIS. The shipyard contract on this vessel, it is understood, amounted to $10,500,000. The INDIANAPOLIS is a 10,000-ton displacement vessel built under the terms of the London treaty. Her armament consists of nine 8-inch guns, eight 5-inch guns, two torpedo tubes and a catapult for launching airplanes. She will have a complement of forty-nine officers and about 550 enlisted men. Orders indicated that she will immediately join the fleet.

Error is Corrected

In describing the tug JENNIE BARBOUR in the diesel section of the November issue of MARINE REVIEW, the power of the two Atlas diesel engines was incorrectly stated as 275 brake horsepower each. These engines are 375 brake horsepower each.



All arc welded oil barge for use in Boston harbor

Bunker Prices

At New York

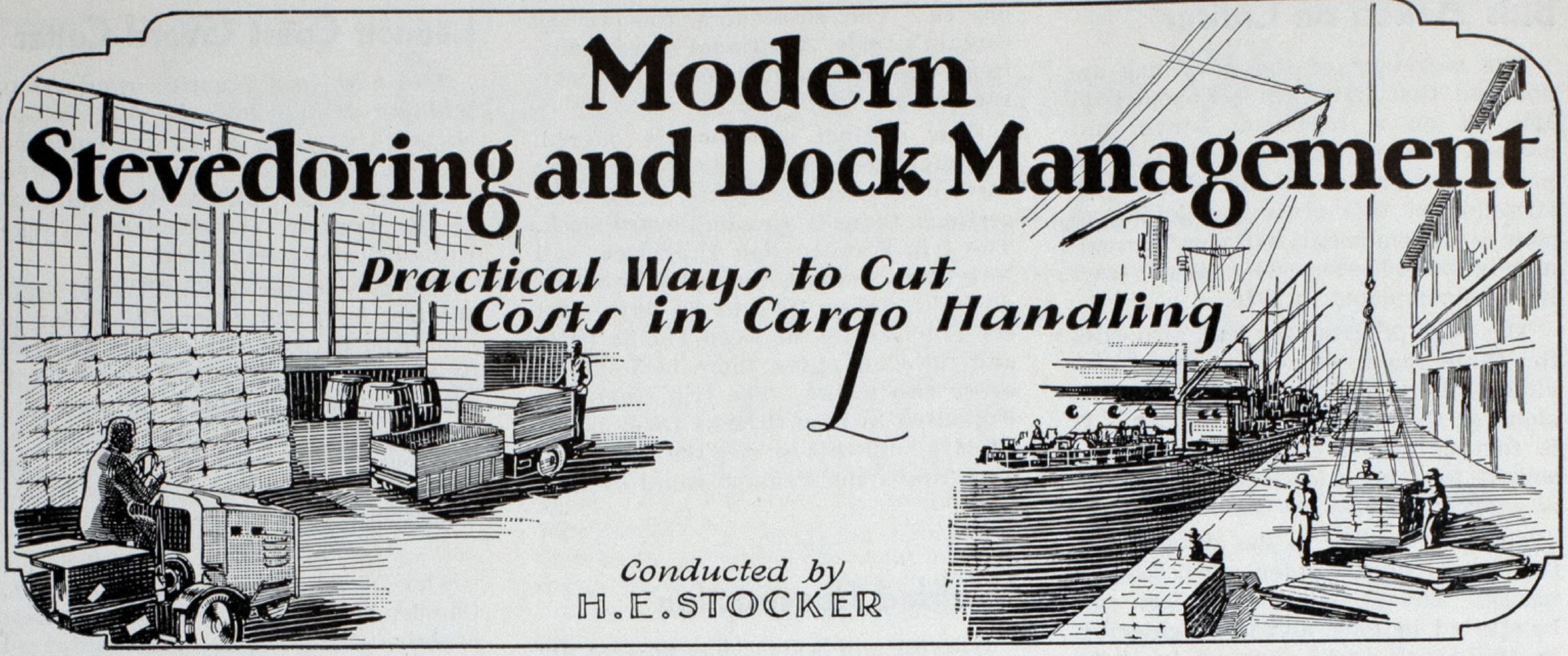
	Coal alongside per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
Nov. 18,1932	4.50@4.75	.80	4.08
Oct. 18,	4.50@5.00	.80	4.08
Sept. 18,	4.50@5.00	.80	4.08
Aug. 18,	4 50@5.00	.90	4.08
July 18,	4.50@5.00	.90	4.04½
June 18,	4.50@5.00	.80	3.70
May 18,	4.50@5.00	.75	3.70
April 18,	4.50@5.00	.70	....
Mar. 18,	4.50@5.00	.65	3.25
Feb. 18	4.50@5.00	.65	3.25
Jan. 18	4.50@5.00	.65	3.25

At Philadelphia

	Coal trim in bunk per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
Nov. 18, 1932	4 00@4.75	.80	4.04
Oct. 18,	4.50@5.00	.80	4.04
Sept. 18,	4.50@5 00	.80	4 04
Aug. 18,	4.50@5.00	.90	4.04
July 18,	4.50@5.00	.90	4 08
June 18	4.50@5.00	.80	3 69
May 18,	4.50@5.00	.80	3.69
April 18,	4.50@5 00	.75	3 21
Mar. 18,	4.50@5.00	.65	3.21
Feb. 18	4.50@5.00	.75	3.45
Jan. 18	4.50@5.00	.75	3.45

Other Ports

Nov. 18, 1932	
Boston, coal, per ton	$——
Boston, oil, f. a. s., per barrel	$0.83
Hampton Roads, coal, per ton, f.o.b., piers	$4.25
Cardiff, coal, per ton	13s 6d
London. coal, per ton	—s –d
Antwerp, coal, per ton	17s 3d
Antwerp, Fuel oil, per ton	67s 6d
Antwerp, Diesel oil, per ton	82s 6d
British ports, Fuel oil	67s 6d
British ports, Diesel oil	82s 6d



Scientific Management Can be Applied to Cargo Handling Operations

By H. E. Stocker

LARGE shortages of canned goods were causing considerable losses to a steamship line in New York city. New York claimed that the cargo was lost in London and the London organization sharply criticized the New York agency for its incompetence. The man in charge at New York was convinced that the cases did not disappear at his pier. An investigation was started. Each checker's record was studied to determine if there were anything that might lead to the discovery of losses due to dishonest checking. The competence of the checkers was studied and the shortages were compared against the cases checked by individual checkers to determine if they ran consistently to any one or more checkers.

A Mysterious Leak Found

Neither of these investigations disclosed any fact upon which to fortify the criticism of the New York organization. But losses and fault finding continued, so the investigation continued. A comparison was made of the losses and the railroad lighters which delivered the cargo. It was thought that this investigation might disclose shortages running consistently against certain lighters. However, the losses were found to be scattered at random.

Finally since losses and criticism continued the additional expense of providing two checkers at each hatch was thought to be necessary to definitely determine if the losses occurred at New York. One checker checked the cases on to the sling. Each sling load had the same number of cases, so that when it was hoisted over the rail the checker on deck could count the sling loads and then be able to determine the number of cases. Each draft was numbered so that if the head checker or the ship's officer at the hatch came along and asked the checker what the next draft was, this could be compared with the chalk mark on the draft and the wide-awakeness of the checkers determined. The ship's officer at the hatch signed for each lighter. In this manner the shortages were definitely proved not to have originated at New York. This lead to a real investigation on the other side, with the result that a ring of thieves was broken up and the shortages stopped.

When this story was related to me by the man in charge of the New York terminal, I told him that this method of arriving at a solution was scientific management. He had not thought of it as scientific management. It seemed just a sensible analysis of a difficult problem, but since the very essence of scientific management is thorough analysis, this captain had applied the scientific method to a problem of terminal operation.

Every terminal is a problem in itself, with its own physical and operating conditions, so that a terminal superintendent is deprived of the aid of comparing with and copying the practice of other terminals, except as to details not controlled by the conditions. For example, rubber tires or automatic couplers on trailers are universally advantageous.

The scientific method as developed in business during the past forty years has given us tools with which comparison of terminals and the details of operation can be made upon a more accurate basis, thereby, opening a new way to eliminate waste.

Each Terminal a Problem

These tools have been used in the shiping industry both as the result of the exercise of a high degree of common sense and by the conscious application of similar methods arrived at by the training of men in the methods of scientific management.

Scientific method is the use of the highest degree of common sense. It is the fullest use of common sense because it utilizes the proved methods of obtaining the best result.

The operating costs of a terminal may be excessive because of a small but continuous wastage from every pore, which attracts little or no attention, although resulting in losses which in some cases are equivalent to a good return on the investment. It requires certain training and experience to appreciate the losses existing, and still more training and experience is required to understand the remedies. No man can detect these

small losses except in a general way without a special investigation.

In one company, these accumulated losses amount to at least 10 per cent of the investment. At the low point of the depression, this 10 per cent would have been sufficient to keep the company out of the red."

Estimates can be made by proceeding on correct principles and by using proper care, which should be a sufficient guide, and hence, when made, should always be followed carefully in preference to judgment and guess.

The more difficult it is to reach absolute correctness, the greater the need we have of some guide which shall reduce the unavoidable guess work to its lowest point and so save us from the numerous hazards which result from not only guessing at facts, but at the effects of those facts. Whatever care we use we can never attempt, with success, to fix the exact point where economy ends and extravagance begins, but what we can do is to establish certain narrow limits in either direction, somewhere within which lies the truth. and anywhere outside of which lies a certainty of error.

No company is so poor that it can afford to economize when additional expenditures will be clearly profitable. If it is understood or believed for good reason, that a given additional investment will certainly pay 10 or 15, 25 or 50 per cent it may almost be said that the poorest company can find ways and means for obtaining the capital, if the facts are properly and clearly presented.

It is impossible to get a definite accurate conclusion upon which to base a waste elimination effort without the aid of a great development of scientific managements—time and motion studies disclose details which are overlooked by one not familiar with the general principles and the accomplishments of this tool of industry.

"Because it is easy to purchase a stop watch and go through the motions of making observations and analysing the resultant data, the use of time study has spread with great rapidity and a large, if not the greater part of it is of questionable value. Superficial time studies can be as destructive to operating control, accuracy of cost computations and agreeableness of human relations, as superficial measurements of a civil engineer can be to the safety and performance of a bridge or skyscraper. On the other hand, however, accurate time studies can be as useful to management and workers as accurate measurements to the designer of a bridge." (*Scientific Management in American Industry*—The Taylor Society).

No increase of expenditure over the unavoidable minimum is expedient or justifiable, however great the probable profits and values of an enterprise, as a whole, unless the *increase* can, with reasonable certainty, be counted upon to be, in itself, a profitable investment. Conversally, no saving of expenditure is expedient or justifiable however doubtful the future of the enterprise as a whole, when it can, with certainty, be counted on that the additional expenditure will at least, at the cost for the capital to make it, be in itself a paying investment.

Profitable operation depends upon the skill with which the investment is kept small, and the productive or earning power is made large in accordance with these principles.

Scientific management requires an executive leadership of a high order—it requires a viewpoint which seeks for rather than discourages new ideas, and, while encouraging the development of new ideas throughout the organization, tempers the optimism of the proponents of new ideas, with hard facts. New ideas, particularly those involving large expenditures or risks of large operating losses, are subjected to thorough analysis and checking with all the accumulated experience available. It is characteristic of the scientific method whether it be in astronomy or cargo handling that the fullest possible use is made of accumulated experience.

Receptive to Experience of Others

The application of this method to the handling of a certain kind of cargo increased the discharging from 37½ tons per hatch hour to 52½ tons per hatch hour. The stevedore who was not able to do better than 37½ tons an hour bragged about his 20 odd years of experience, but because he did not use the accumulated experience of his neighbor, a few piers down the river, he lost the contract. The new stevedore used the accumulated experience of several men and within a short time improved the discharging to 52½ tons an hour and used 2 to 4 less men in the gang.

Scientific methods accepted and knowingly applied to the solution of cargo handling problems will achieve greater results than if not so applied. One steamship line would have saved $70,000 additional and would be saving $30,000 a year now in a year of depression instead of paying these savings for the purchase of equipment if the problem of reducing cargo costs had been studied in the light of accumulated knowledge available and the use of a thorough analysis of the problem had been made. In other words, scientific management would have achieved three years ago what ordinary management achieved three years later.

In another case, a steamship line is saving $40,000 a year without any expenditure for equipment because a scientific management trained executive disclosed the possible saving and made it effective quickly.

Most stowage plans and hatch lists that I have seen are inadequate either because the purpose of stowage plans and hatch lists is not understood clearly or because by ignoring the accumulated experience of the men within and without the company, the knowledge is lacking how to prepare a stowage plan which would show quickly and clearly the location of each lot of cargo in the ship and give all the information necessary to plan the discharging and to advise consignees when they may expect to get their shipments.

A company infused with the principles and methods of scientific management would plan a stowage plan and hatch list which would satisfy the above objectives to the best advantage because it would adapt to its conditions the best knowledge available. A well planned stowage plan, and hatch list will soon repay the effort necessary in reduced stevedoring costs and in retaining, if not gaining, traffic for the line.

When acquiring ships or terminals equipment, an organization managed in accordance with the principles of the scientific method buys performance rather than just ships or terminals equipment. A cargo ship or terminal is designed as an economical cargo handling unit. Everything is subservient to that end. Tractors and trailers, skids and lift trucks or cranes are acquired for the economical handling of cargo—performance in number of tons handled an hour is the measure of efficiency.

Scientific management is all conclusive management. It handles each problem or department with respect to every other problem and department. Claims for example are handled not with the idea of keeping claim payments down by being hardboiled, but each claim is handled with respect to the operating, traffic and claims policy of the company, and with the objective of achieving the maximum net profit for the company.

Scientific managemnt is only a term to describe a method. It might be called modern management or engineering management, the name is not important—the substance is.

The methods of science are:

1—The careful definition of the problem to be studied.

2—The accurate and complete collection of information.

3—The analysis and classification of this information relevant to the statement of a solution or conclusion.

4—The tentative formulation of a solution or conclusion as a working hypothesis.

5—The testing of this solution in actual performance to see if it is sound and the adoption of the conclusion as correct and constituting a sound working basis as long as the facts and forces on which the conclusions are based remain substantially the same.

The application of these methods and management co-ordinates scientific management.

Straits of Mackinac

(*Continued from Page* 31)

with docking space for three boats, besides leaving docking space for one boat on the northerly side of the old pier.

There are six ramps on the new pier so located as to accommodate the two gangways of the boats. Each ramp is fitted with a heavy steel apron or gangplank, easily adjusted by hydraulic jacks to accommodate varying stages of water and corresponding changes in height of the main decks of the boats. An elevator capable of handling two cars at once has been installed on the dock for loading the upper decks. The design of this terminal was carried out by the State Highway Department with L. C. Sabin, Cleveland as consultant.

With the Mackinaw City docks improved for the rapid handling of motor vehicles of all types as well as fitted with every modern convenience for waiting passengers, attention was directed in the spring of 1932 to the St. Ignace dock.

Terminal at St. Ignace

As already noted this dock, though of ordinary pile and timber construction, had thus far continued to serve the purpose. Additional land had been purchased on either side of the old Chambers dock property; also a nearby dock for the storage of coal, thus leaving the rebuilt Chambers dock entirely free for the handling of cars, as shown in one of the illustrations.

The old dock has been completely enclosed on the water side with steel sheet piling and backfilled with rock and all capped with concrete. This dock is also equipped with ramps with adjustable aprons, an elevator for loading the upper decks, waiting room for passengers properly heated and equipped with all sanitary conveniences. The extra land space not needed for the handling and storage of cars, has been landscaped so that now in addition to providing space for the rapid handling of cars, it presents an attractive appearance.

However, the state recognizes that low cost ferry service for the entire year is a reasonable demand on the part of the public. Arrangements have therefore been made with the Mackinac Transportation Co. which operates ice crushing carferries throughout the winter and whose tariffs are fixed by the interstate commerce commission, to pay the difference to that company between its rates and the rates charged by the state during the season of navigation. This has been done for the past four years at a total cost to the state, of $34,179.20 or an average of $8,545 a year.

At present the state's investment in docks and boats is as follows:

Three boats	$687,423.00
St. Ignace dock, partly estimated since not completed	225,000.00
Mackinaw City dock	607,613.00
Total	$1,620,046.00

The question is frequently asked, "Why does not the state reduce the tolls on passengers and cars?" But the act authorizing this service instructed the state highway commissioner to fix the rates at a price that would cover operating costs, depreciation and interest on the investment. Considering the rather large outlay as above noted, all in the interest of improved service, it is apparent that the point has not yet been reached where the tolls can be reduced without violating the law.

Diesel Tug Completed for Quarantine Service

RECENTLY delivered to the quarantine station, Boston, the new diesel tug T. B. McCLINTIC, is the latest addition to the fleet of the United States public health service. This vessel was designed for quarantine boarding duty by P. W. Clark, associate naval architect of the public health service, and was built by the Bath Iron Works, Bath, Me. The entire hull is constructed of genuine wrought iron plates supplied by A. M. Byers Co., Pittsburgh; wrought iron rivets were also used. The deck and superstructure are of steel with no interior sheathing in order to facilitate maintenance. Every compartment in the hull is provided with ample ventilation to minimize sweating of structural members and shell.

The McCLINTIC is 60 feet 10 inches in length overall, 15 feet 4 inches in molded beam, and 9 feet 3 inches in depth and has a loaded draft of 7 feet 2 inches. Propelling machinery consists of one Standard Motor Construction Co. direct reversible, four-cylinder, 8½ x 12 inches, 100 horsepower diesel engine. A Fairbanks Morse & Co. auxiliary unit, driven by a 16 horsepower at 800 revolutions per minute. Fairbanks Morse diesel engine, provides 110-volt direct current electric power from the 3-kilowatt generator, air from a 23 cubic feet per minute compressor and water for fire and bilge service from a 136 cubic feet per minute rotary pump. Heat is supplied by an oil burning Crane boiler for hot water heat. Fresh water for sanitary purposes is supplied from tanks containing water under a small air pressure. The propeller is a three-bladed solid bronze wheel, 50 inches in diameter by 36 inches pitch supplied by Colombian Bronze Co.

During trials in the Kennebec river this vessel made 9.4 knots at 355 revolutions per minute with an apparent slip of 10.9 per cent. Fifteen persons were on board including crew and observers. The turning circle was approximately 100 feet in diameter and the period of complete roll was 5.8 seconds.

The McCLINTIC was delivered under her own power from Bath, Me. to Boston, following a heavy October storm. She was tested taking the seas at all angles and showed a very comfortable roll as well as ample stability. The average speed from Bath to Boston was 8.85 knots.

Becomes General Agent

P. V. G. Mitchell, vice president of the Roosevelt Steamship Co., recently announced that this company has been appointed general agent for the States Steamship Co., Portland, Oreg., effective Nov. 15.

The Roosevelt company will handle all business in connection with the new passenger and freight service between Portland and the Orient to be inaugurated with the three liners, GENERAL PERSHING, GENERAL GRANT and GENERAL LEE. The GENERAL PERSHING will open the sevice with a sailing from Portland on Dec. 28.

The ships will call at Yokohama, Kobe, Shanghai, Honkong and Manila. These vessels, 390 feet in length and 50 feet in beam with a service speed of 14 knots, have accommodations for 94 passengers each. They are designed to carry a large amount of refrigerated cargo and will also carry general cargo.

T. B. McClintic, diesel tug for quarantine service recently completed at Bath

Useful Hints on Cargo Handling

MAXIMUM net revenue, the reason for the existence of all business concerns, cannot be secured unless complete facts are obtained by painstaking investigation and so recorded as to be readily available for all those who need them. Business men must be governed by facts and deductions based on facts, and it is far better to get them by scientific investigation than by "arm chair" guess work.

This requires a consant, never-ending search for all the facts, supplemented by careful checking in order to insure accuracy. This search for information must be continuous because conditions are constantly changing.

Nitrate of Soda Stowage

NITRATE of soda (salt petre) is shipped in bags principally from Chile and Peru or in barrels when manufactured. It is very inflammable and explosive and forms, when mixed with organic matter, dangerous compounds. As it is heavy and stows well a ship does not load herself full. Nitrate must be well dunnaged as it has a great affinity for water, and moist air will cause considerable loss to the shipment during the voyage. It should not be stowed over other goods as there is always some drainage, and as there is rather a strong odor to such shipments, they should preferably be stowed by themselves.

Sailing vessels stowing nitrate for long voyages usually stow it pyramidically from the sides, except for some tiers on both sides that go right out, so as to bind the shipment and prevent it from shifting. With shipments of nitrate, bilges should be pumped regularly and the ship's bottom should be kept dry. For the protection of the cargo, the deck must be tight as any leakage there will pass through the different layers of bags and cause a considerable quantity to be dissolved. There is always a percentage of loss during a voyage.

On Using Manila Rope

ONE of the recommendations of the marine safety code committee of the Pacific coast refers to rope for hoisting bridles, rope slings and other purposes, and calls for rope of pure manila fiber, or standard marine or stevedore grade or better. When this rope is of strength in accordance with federal specifications of the bureau of standards, it shall have a minimum circumference of 3 inches for loads of one ton or less; a minimum circumference of 4 inches for loads in excess of one ton and not over two tons; a minimum circumference of 6 inches for loads over two tons and not over four tons. For loads in excess of two tons, wire rope is recommended, which should be used for all loads in excess of four tons.

THIS page is being devoted to short items on all matters having to do with the more efficient turnaround of ships. These items are intended to be of a helpful nature.

We will welcome for this page brief descriptions, illustrated if possible, of any better or safer way of performing any function in cargo handling. Also, any questions submitted will be answered by the editor.

Manila ropes should be carefully inspected at frequent intervals during operation. Ropes should be immediately discarded if showing any indications of the following; Cuts or bad abrasions, acid spots or any unusual discolorations, if it has lost its stretch, or if its fibers have lost their brightness.

Ropes which tend to untwist or where strands slip out of place are overloaded and should be replaced with larger sizes. Rope slings should be used only where there is danger of damaging material being hoisted by the friction of wire rope.

Use of Shifting Boards

FOR shifting boards, when carrying grain in bags, the different underwriters and chambers of commerce, the world over, have their definite rules, which must be complied with.

Shifting boards for other shipments, such as ore, sand, etc., do not need to be tight, but they must be well shored off and sufficiently strong, and if the planks are lashed to stanchions in the hold, planks should be lashed opposite each other with a 9-inch vertical space between the planks if using 12-inch planks. The weight and nature of such shipments give an angle of repose of not more than 60 degrees and the danger of shifting is, therefore, not so great by far as with cargoes of grain.

Shipping Railroad Material

RAILROAD material is heavy, bulky cargo and must be handled with great care in loading and discharging. In the ship's holds, it must be well secured and if necessary shored off. For broken stowage with such material must be used cargo that will not suffer damage when discharging the heavy stuff, or it must be discharged first.

For broken stowage, in cases of this kind, bales of hay, rope or gunnies will work out well. When stowing, for instance, automobiles on top of locomotives, there should be dunnage of planks between.

Stowing of Rice in Bags

RICE shipped in bags when new must, on account of heating, steaming property and great affinity for moisture, be especially well ventilated and dunnaged to a greater extent than other foodstuffs in bags.

With shipments of new rice, the bulkheads, ship's sides, masts and ventilators must be dunnaged so as not only to keep the bags away from the iron, but also to allow sufficient space for the moist air to pass up to hatches and ventilators from the lower parts of the hold. The ship's bottom should be dunnaged 4 inches above the ceiling and in such a way as to allow the air to circulate. Matting must be used in the bottom of the ship wherever the bags may touch iron, under stringer plates, in way of the upper bags, in the wings of the ship and under the hatchcombings.

Bags of rice should be stowed to provide alleyways at every fifth tier longships and athwartships for air to escape through. Furthermore, such alleyways must be connected with shafts going down to the bottom of the ship in all hatches.

If there is much difference between the temperature in the ship's hold and the air outside, the ventilators should all be turned from the wind and the hatches should not be uncovered. As it is very susceptible to scent, rice should not be stowed in the same space with shipments giving off a strong odor. When the rice is old, many of the heating and steaming properties it has when new disappear, and it can then be stowed as other foodstuffs in bags. No wet or damaged bags of rice should be loaded, as such quickly affect others and when decomposition has once started, it progresses rapidly.

Personal Sketches of Marine Men

W. W. Smith, Chief Engineer, Federal Shipbuilding & Dry Dock Co.

By Ben K. Price

Photo by Blank & Stoller

HE HAS contributed much to the development of efficient propulsion machinery since the earliest application of the geared turbine drive.

A GRADUATE of the United States Naval Academy, he specialized in engineering duty during the ten years of his naval service.

THROUGH his unusually active interest in marine engineering, he has greatly aided in raising the standard of technical information.

IN CONTEMPLATING the mechanical perfection of the Grace liner, SANTA ROSA, put into service late in November, the name of W. W. Smith cannot fail to occur and impress the minds of shipbuilding men. For it was Mr. Smith, chief engineer of the Federal Shipbuilding Co., Kearny, N. J., builder of the magnificent SANTA ROSA and the three sister ships to follow, who has contributed so greatly to the development of the geared turbine type of machinery.

Dating back to around 1910, Mr. Smith has been engaged in the development of this machinery, first as a lieutenant in the navy assigned to work on the design of geared turbines for the navy collier NEPTUNE, co-operating with the Westinghouse Electric & Mfg. Co.; then later in charge of the marine work of the Westinghouse company; and finally in his present position as chief engineer of the Federal Shipbuilding & Dry Dock Co.

Mr. Smith was born at Versailles, Ky., in 1882, and was graduated from the United States Naval Academy, Annapolis, Md., in 1902. He then spent the following 10 years in naval service, advancing from midshipman to lieutenant. From 1907 to 1909 he was chief engineer on the SALEM, one of the first of the navy's turbine scout cruisers. It was then that he was assigned work on the design of the turbines for the NEPTUNE. In this period he was located at both Washington and Pittsburgh, later to be given duty aboard the NEPTUNE.

Incidentally, in his work Mr. Smith acted under the direct supervision of George Westinghouse, whom he came to know well, and in whose employ he was to enter in 1912, remaining for five years.

In 1917, with the entry of this country into the World war, Mr. Smith became affiliated with the Federal Shipbuilding & Dry Dock Co., Kearny, N. J., a newly organized subsidiary of the United States Steel Corp., as chief engineer. Needless to say, his services were drawn upon heavily from the first. During the war, the Federal yards turned out thirty 10,000-ton turbine ships for the shipping board, and it might be added there was not a lame duck in the lot. Since 1917, when Mr. Smith first became associated with the company, the Federal yards have built more than 100 ships of one type or another, and have installed many types of marine machinery, including steam turbines, diesel direct-drive and diesel electric.

One of the more outstanding ships to engage Mr. Smith's attention at the Federal yards was the DIXIE, delivered in 1927. This ship was a forerunner of high pressure temperature turbine ships in this country. Other outstanding ships were two tankers for the Standard Shipping Co., the G. HARRISON SMITH and the W. S. FARISH, delivered in 1930. These tankers have a fuel consumption of .597 pound per shaft horsepower per hour which is a remarkably low consumption for a 4000-horsepower installation. As previously indicated, the four sister ships of the Grace line are being equipped with machinery of similar type, but of even greater efficiency.

Mr. Smith is active in marine association work. He is a member of the council of the American Society of Naval Architects and Marine Engineers. He is chairman of the publications committee of that organization, which during the past two years has changed entirely the printing of the society's transactions. Mr. Smith is also a member of the paper committee of the society.

Mr. Smith is on the technical committee of the American Bureau of Shipping and on the American Marine Standards committee.

While he is known to the shipbuilding industry primarily for his contributions to advancement in machinery design, he is also known to his co-workers and associates for the efficient management of his department at the Federal yards. If he has a hobby, or an interest secondary to his main mission in life, it is the efficiency of his department, his friends declare.

Up and Down the Great Lakes

Lake Bulk Traffic—Oppose St. Lawrence Seaway—Lake Levels—Court Rules on Sinking—Reduced Ore Stocks

DURING the month of October the total American lake movement in Lake Superior iron ore totaled 926,561 tons compared with 3,094,424 tons for the month of October, 1931. Up to Nov. 1 this year the total movement of iron ore was 3,317,716 tons, compared with 23,047,192 tons during the season of 1931 up to Nov. 1.

Total traffic through the Canadian and the United States locks of the Sault Ste. Marie canals for October this year amounted to 3,923,860 tons which was 63 per cent of the October, 1931 tonnage and 43 per cent of the October, 1930 tonnage. It is interesting to note that the iron ore traffic showed an increase over September but that it was only 28 per cent of the 1931 tonnage. Wheat shipments amounted to 36,908,695 bushels as against 27,818,194 bushels for the same month last year. Other grains also showed an increase this year over last.

For the fifth consecutive month, the Welland ship canal has shown an increase in the transit of freight as compared with 1931 records. Wheat increased from 280,835 tons in 1931 to 401,786, tons, corn from 14,645 tons to 72,215 tons, merchandise from 48,066 tons to 115,106 tons, bituminous coal from 230,287 tons to 322,594 tons, pulpwood from 2235 tons to 44,456, gasoline from 20,971 tons to 43,661 tons, and total freight from 850,582 tons to 1,251,829 tons.

Total traffic using the St. Lawrence canals during October amounted to 1,013.542 tons as against 794,975 tons in the month of October, 1931. All grains showed increases, wheat leading with an increase of 108,380 tons or from 288,371 to 397,751 tons. A marked increase in merchandise is also shown, from 66,347 tons to 149,-025 tons. Gasoline increased from 10,286 tons to 33.936 tons. From the opening of navigation to the end of October, the total freight tonnage through the St. Lawrence canals was 5,902,447 tons as compared with 5,341,-588 tons in 1931.

Oppose St. Lawrence Seaway

The Lake Carriers association on Nov. 10 by action of its executive committee adopted a resolution going on record as opposing the signing of the treaty between Canada and United States for the completion of the Great Lakes-St. Lawrence waterway to permit the passage of ocean-going vessels.

A group of the Lake Carriers executive committee, including Capt. Joseph S. Wood, president of the association, L. C. Sabin and George A. Marr vice president and A. E. Cornelius of Buffalo, a member of the executive committee presented its views before the Borah subcommittee of the Senate.

October Lake Levels

The United States Lake survey reports the monthly mean stages of the Great Lakes for the month of October as follows:

Lakes	Feet above mean sea level
Superior	602.61
Michigan-Huron	578.10
St. Clair	573.58
Erie	570.65
Ontario	244.57

Lake Superior was 0.33 foot lower than in September and it was 0.26 foot higher than the October stage of a year ago.

Lakes Michigan-Huron were 0.18 foot lower than in September and they were 0.42 foot lower than the October stage of a year ago.

Lake Erie was 0.57 foot lower than in September and it was 0.30 foot lower than the October stage of a year ago.

Lake Ontario was 0.47 foot lower than in September and it was 0.33 foot higher than the October stage of a year ago.

Court Rules on Sinking

A formal investigation was held at Toronto, Ont. Oct. 11 and 12 into the circumstances attending the foundering of the S. S. JOHN J. BOLAND JR., with loss of life, on or about Oct. 5, 1932 in Lake Erie about twenty miles east of Erie, Pa. while bound from Erie to Hamilton, Ont. with a cargo of coal. The court was presided over by Capt. L. A. Demers, dominion wreck commissioner, assisted by Capt. C. J. Smith, and Capt. B. A. Bongard, acting as nautical assessors.

The court found: First, that without instruction from the owner, the ship loaded in her holds to full capacity as it was asserted, took an additional cargo on deck which was distributed in the spaces between hatches without battening the hatches, thereby rendering this last operation difficult, necessitating labor in keeping or having the hatchcoamings clear for the purposes of battening. Second, when the ship took a sharp list to starboard caused, it is said, by a heavy wave which struck her from the port quarter, the master brought the ship voluntarily or allowed the vessel to come to bringing the seas more towards the quarter with the intention of offering more lee, to permit the launching of the starboard boat which under the circumstances was a wrongful act of seamanship indicating lack of resourcefulness due to inexperience.

The court found the master in default and suspended his certificate from Oct. 12, 1932 to Jan. 1, 1934. The decision pointed out that resourcefulness was lacking, that there was no willful neglect, but an evasion of precautionary measures due, it is said, to a custom prevailing on the lakes, also to overzeal which the court does not countenance or appreciate. Recommendation was made that a certificate as mate be issued for the period of suspension of the master's certificate and pointed out that in the condemnation and penalty inflicted, great clemency was exercised. The first mate Smith was warned and at the same time commended for his action in placing life belts on the two women members of the crew. Second mate Burtenshaw was held not to blame.

The court urged that a meeting be arranged between the authorities and Great Lakes shipowners during the winter months to devise some means whereby dangerous pernicious customs which are said to exist on inland waters may be abolished, such as indifferent stowing, trimming of cargoes, and the carrying of deck loads indiscriminately.

Ore Stocks Are Reduced

Indications are clear that with any measure of resumption of activity in the steel industry, there is likely to be a considerable demand for ore transportation next season. The total amount of ore on hand at Lake Erie docks and furnaces as of Nov. 1, shows a decline of over 7,000,000 tons from the amount on hand at the same time a year ago. This year, Nov. 1, the total of iron ore on hand was 32,456,-607 as against 39,767,233 tons at the same time a year ago. It is expected that the amount on hand would be so far reduced through winter activities as to create a real lively demand for tonnage in the ore trade at the opening of navigation next year.

Marine Review

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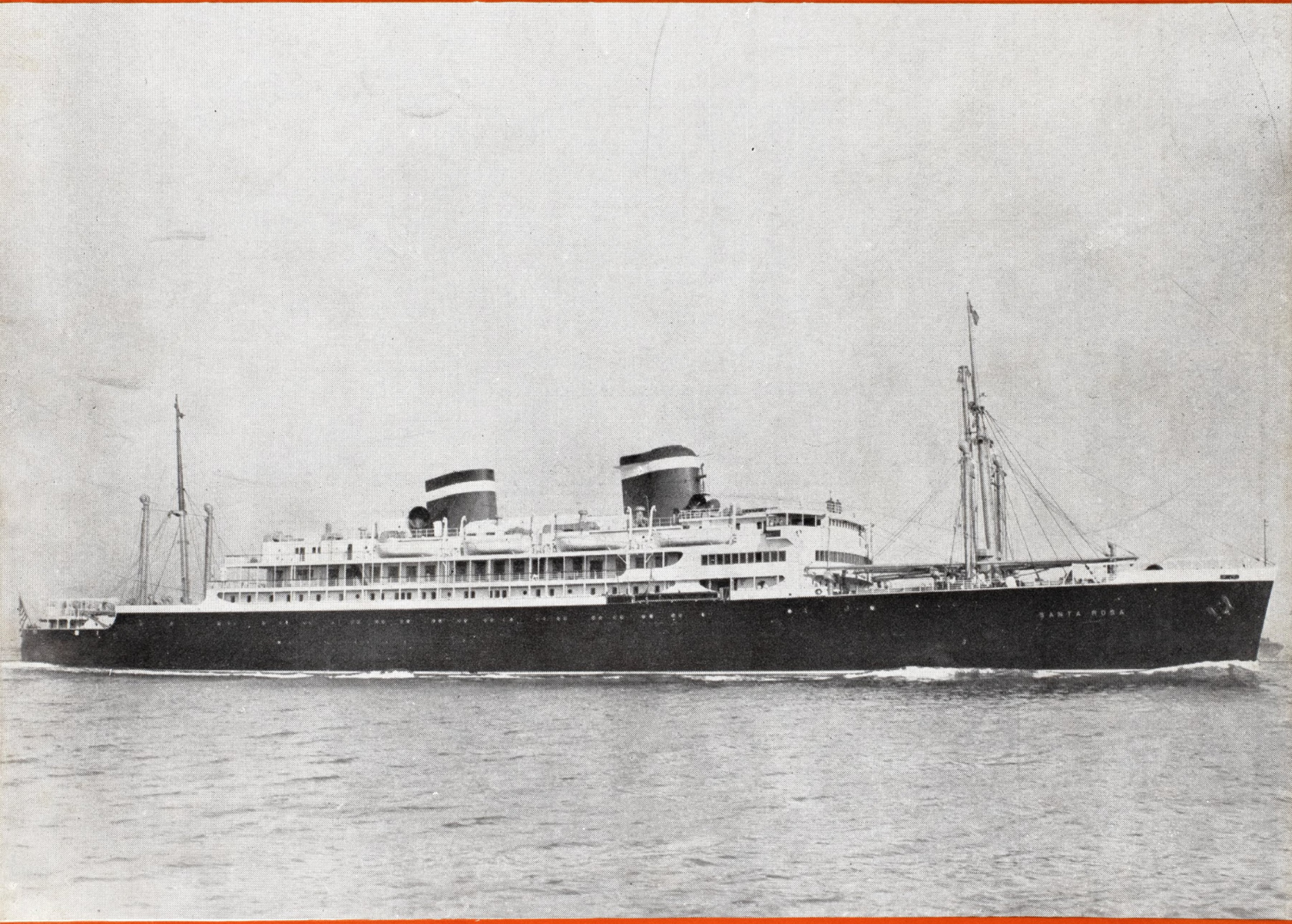
The National Publication Covering the Business of Transportation by Water



S. S. SANTA ROSA

December, 1932

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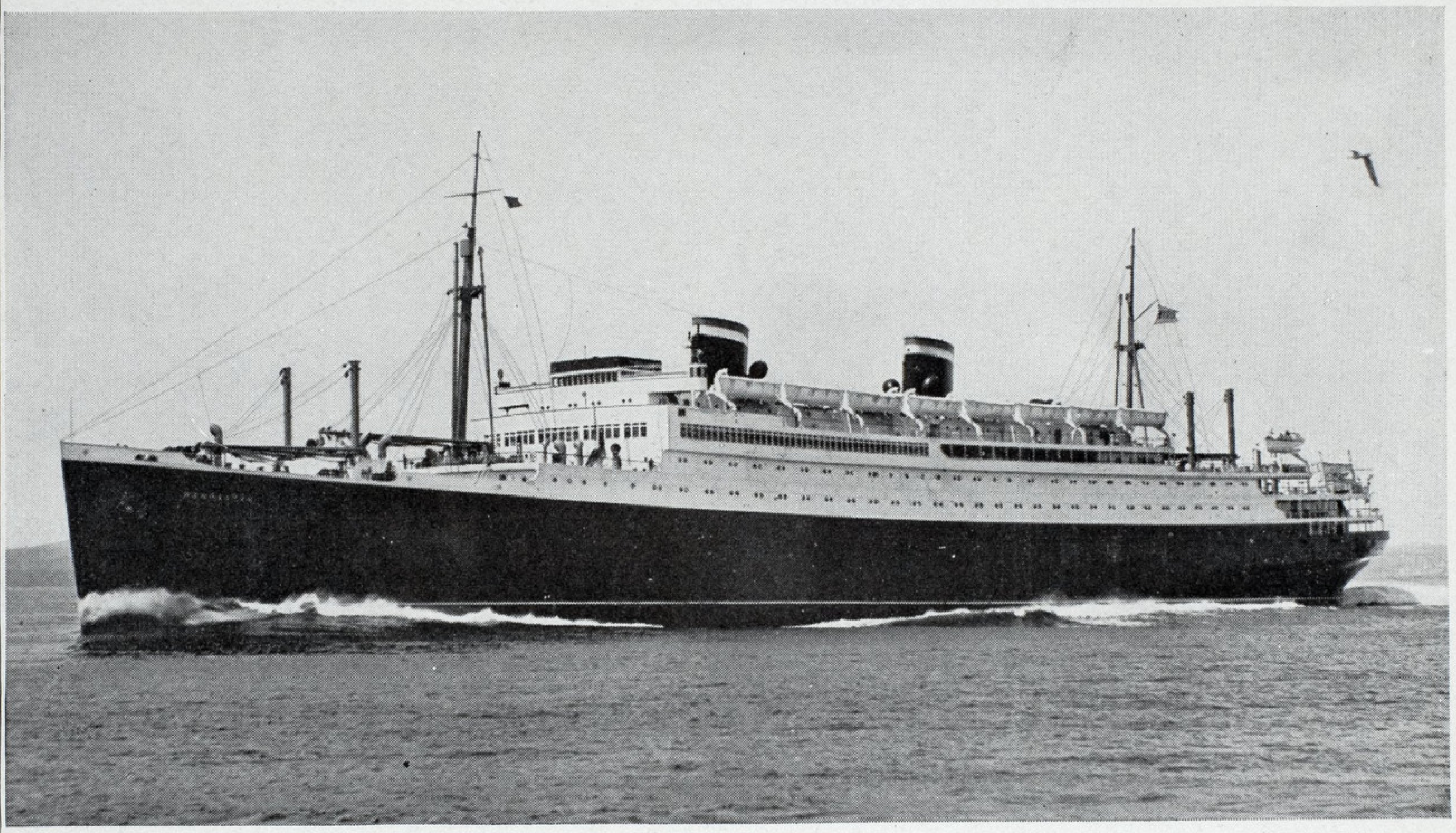

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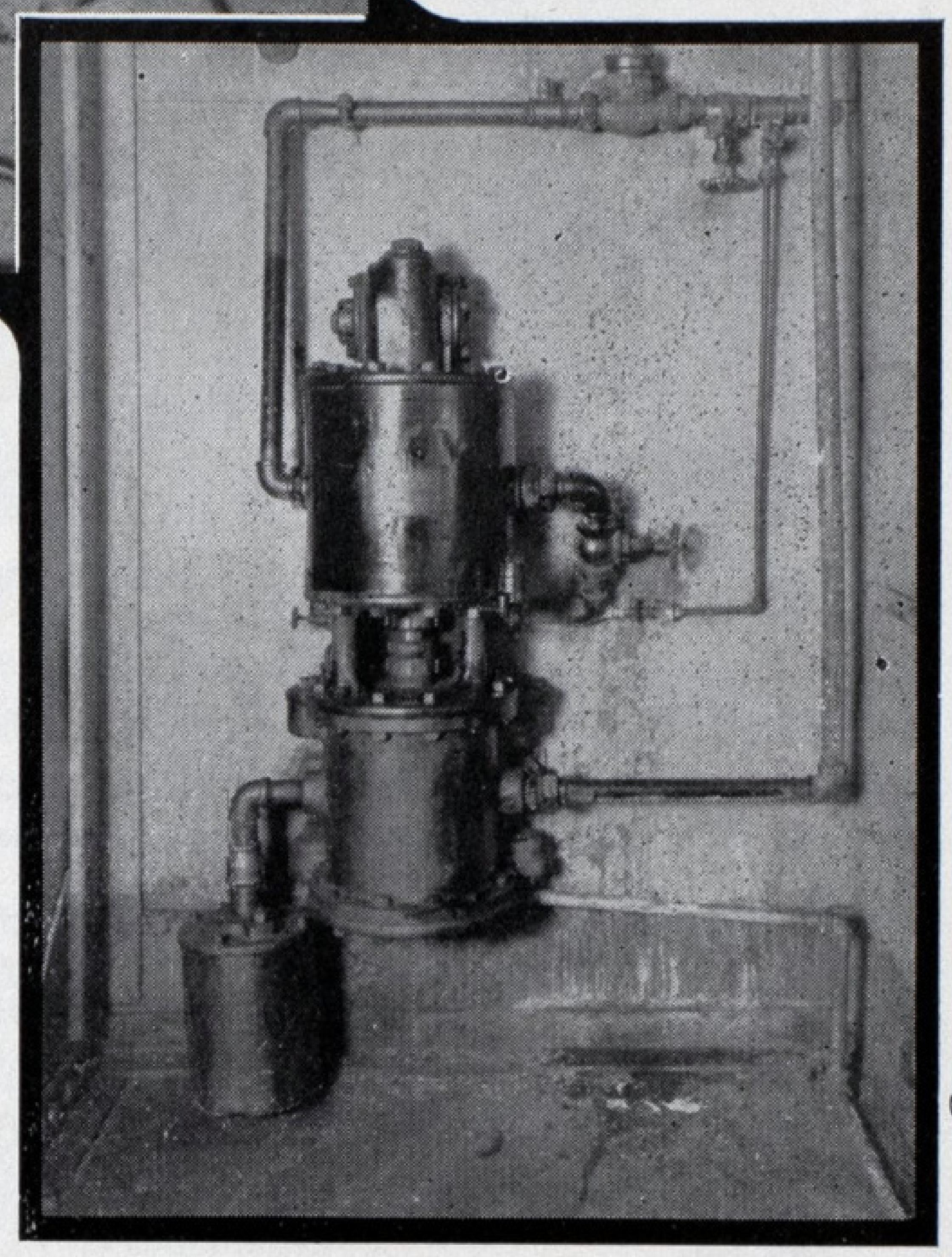
Eight Babcock & Wilcox Boilers

The launching of the *Santa Lucia*



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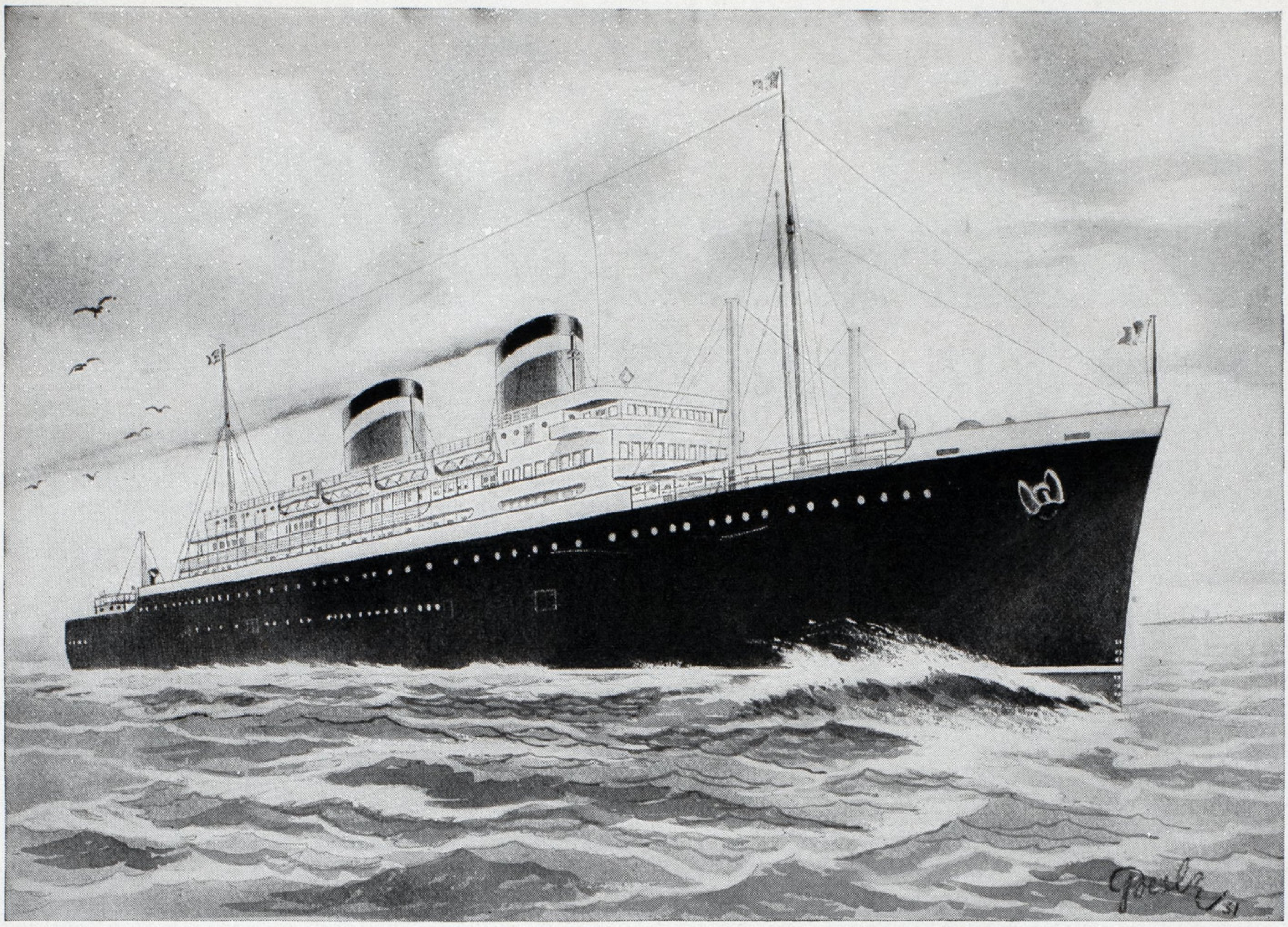

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